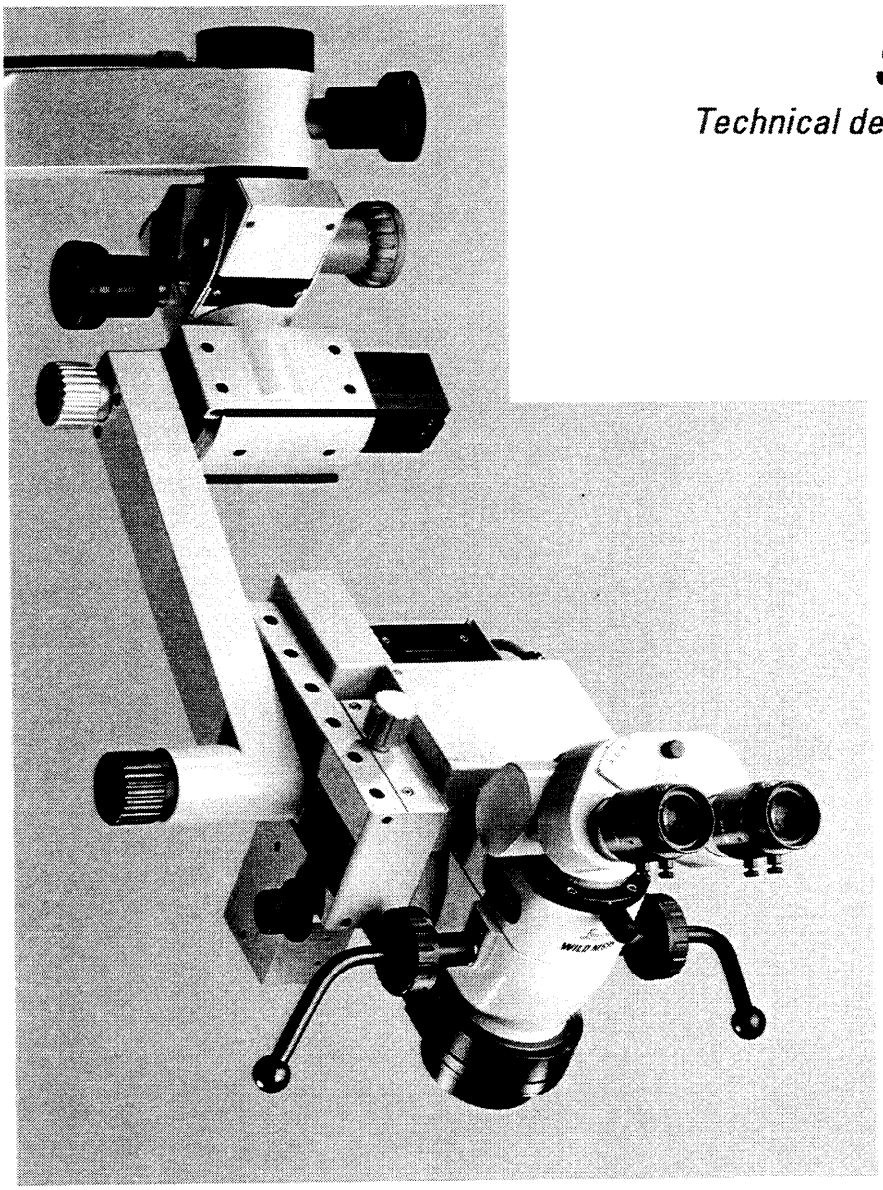
# WILD M695

## Operating microscope



# Service manual

## Technical description and fault finding

*Doc Code 636 718*
*Edition 09/93*

*Revisions*
*10/94*

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*Leica AG, CH-9435 Heerbrugg (Switzerland)*
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Service Manual

# WILD M695

## Operating microscope


| | |
|---|---|
| Legal matters | 1 |
| Revisions/Service News | 2 |
| Introduction / User manual | 3 |
| Fault finding with testset | 4 |
| Control unit MEL61/62, MEL64/65 | 5 |
| Swingarm MSV 136/137 | 6 |
| Microscope M695 | 7 |
| | 8 |
| Wiring diagram | 9 |
| Replacing modules | 10 |
| Replacing boards | 11 |
| Inspection procedure | 12 |
| | 13 |
| | 14 |
| | 15 |
| | 16 |
| Training | 17 |
| Testset | 18 |
| Spare parts catalogue | 19 |
| Special tools | 20 |


Leica

# *Inhaltsvetzeichnis / Table of contents*

| Kapitel | Seite |
|---|---|
| **Rechtsfragen / Legal questions** | 1 |
| **Sicherheit / Safety / Securite / Seguridad** | 3 |

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- Sie kennen die ortsüblichen gesetzlichen, betrieblichen und ausserbetrieblichen Unfallverhütungsvorschriften im Wissen, dass sich diese auf dem aktuellsten Stand befinden.
- Sie benachrichtigen Leica schriftlich, sobald an der Ausrüstung Sicherheitsmangel auftreten.

Service technicians have the following obligations:

- To understand and follow the safety information and instructions on the product and in the user manual.
- To be familiar with local regulations relating to industrial and non-industrial accident prevention in the knowledge that these regulations are up to date.
- To inform Leica immediately in writing if the equipment becomes unsafe.

October 94

Leica

Leica AG, Heerbrugg

# REVISION

**Documentation** : **WILD M695 Service manual**
**(Technical description and fault finding)**

**Status** : Edition 09(93 / Revision, previous: -------
**new: 10/94**

**Reason for revision :** M680 control unit (MEL61/62) is compatible with M695

**Steps to be taken** :

| Section | Remove page(s) | Number of sheets | Introduce page(s) | Number of sheets |
|---|---|---|---|---|
| --- | title sheet | 1 | title sheet | 1 |
| --- | index register | 1 | index register | 1 |
| 2 | --- | -- | 2-1/2 | 1 |
| 9 | 9-1 to 9-8 | 4 | 9-1 to 9-8 | 4 |
| 19 | 19-1 | 1 | 19-1 | 1 |

**File** : Insert this sheet (Revision) in section 2.

Leica AG
Service Documentation
and Training LSG/SOM/SM

R. Aerni

*SOM and SM Service News*
*Surgical Operating Microscopes*

*No.* 10/95

*To* Service staff

*Date/from* June 28, 1995 / 3077-HWE

*File* Workshop binder “Service News” / Service manual M695

*Leica AG*
*CH-9435 Heerbrugg*
*(Switzerland)*

*Re.* **M695 surgical microscope in conjunction with multifocus objective 445 944**

# *Multifocus objective on M695: Readjustment of the illumination*

*Restriction of illuminated area*

When the multifocus objective is used with the M695, the illuminated area available to the surgeon may be shadowed or vignetted even when the the lamp is correctly adjusted.

*Inspect the illumination*

When you use the multifocus objective for the first time, inspect the illumination:

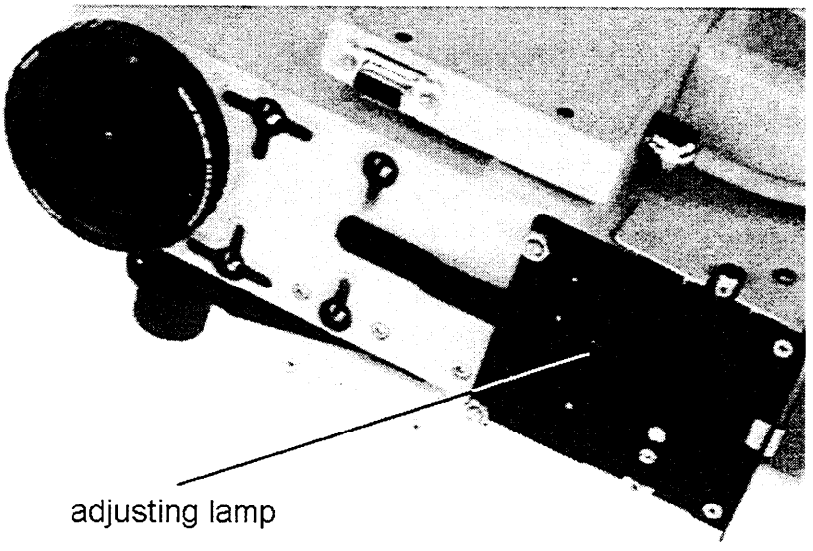
- Engage the shortest working distance (the shortest focal length).
- Engage the lowest zoom position (7).
- Inspect the illuminated fields produced by **both** of the lamps in the lamp changer.
- If the illuminated area is noticeably restricted, readjust the lamps.

*Readjusting the lamp*

The illumination of the field of view is influenced by the distance between the lamp and the condenser lens. This distance can be changed by means of the eccentric stop cam on the lamp changer. To obtain uniform illumination, reduce the distance between the lamp and the condenser lens.

Adjust the eccentric stop cam for both lamps in the lamp changer:

1. Remove the multifocus objective and push the filter slide of the M695 optics carrier towards the objective. Beneath the filter slide you will find the adjusting screw for the eccentric stop cam.



adjusting lamp

2. Using a screwdriver, displace the eccentric stop cam by about one-eighth of a turn so that the lamp can be moved in the direction of the objective.

   ***CAUTION: The lamp may be hot.***

3. Switch to the second lamp, and carry out point 2 for this lamp.

4. Refit the multifocus objective and inspect the illumination as described above.

5. If necessary, repeat the adjustment procedure (points 1 - 3).

Leica AG
Service SOM/SM

K. Bieniek

W. Hammerle

Leica AG
CH-9435 Heerbrugg
(Switzerland)

*No.* 09 / 95

***To*** Service staff

*Date/from* May 29, 1995 / BKL-3402

*File* Workshop binder "Service News" / Service Manual M695

*Refer to* **Necessary replacement of SOM product "Light intensifier" No. 445 796**

## *Faulty product has to be exchanged*

***Delivery of faulty SOM product "Light intensifier" 445 796***

The concerned product has been delivered to the following countries as single part or included in the delivery of optics carriers:

Netherlands, Japan UK, Italy, Australia, USA, Sweden, Canada, Switzerland, Korea, South Africa, Kuwait, Belgium, Spain Columbia, Saudi Arabia, France, Singapore, Finland, Portugal, Germany, Denmark, Algeria, Sudan, Luxembourg, Dominikanische Republic, Hong Kong, Turkey, Brazil, Tunisia, Israel, Austria, Jordanian India.

**All other countries are not concerned.**

***Problem:***

Since market introduction in March 1994 up to March 1995 the concerned product has been delivered faulty (The cement does not withstand the high temperatures at the bulb). It has been delivered as a single part as well as included in the following optics carriers:

| | |
|---|---|
| M690 optics carrier Mitaka | 445 543 |
| M695 optics carrier | 445 560 |
| M695 optics carrier Mitaka OH | 445 841 |

Since March 1995 an improved version with the same No. has been delivering. The two versions can be distinguished easily according to the drawing on page two.

***Action:***

The concerned customers are already informed by your Management.

**The faulty products have to be replaced,** please contact your Marketing responsible for SOM products.

**All concerned countries will be supplied automatically without any order with sufficient replacement units, free of charge.**

**The exchange procedure is very simple** and can **be achieved by the customer himself as** well. If you will not carry out the exchange yourself, supply the customer with sufficient exchange units and Information.

**The action of replacement has to be achieved ASAP and should be finished by end of September '95 at the latest.**

Please send a **feedback after fully finish of the action of exchange with** a list of all concerned customers to the

**SOM HOTLINE: Fax: ++41 - 71 - 72 26 77**

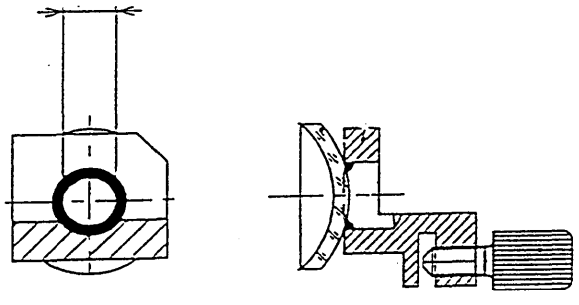
This is necessary for reasons of product liability.

Your expenses on this action will be refunded by us via the 'Repair Report to Factory" (Please fill out the report completely, one report for the complete action!).

***Fig.1:***

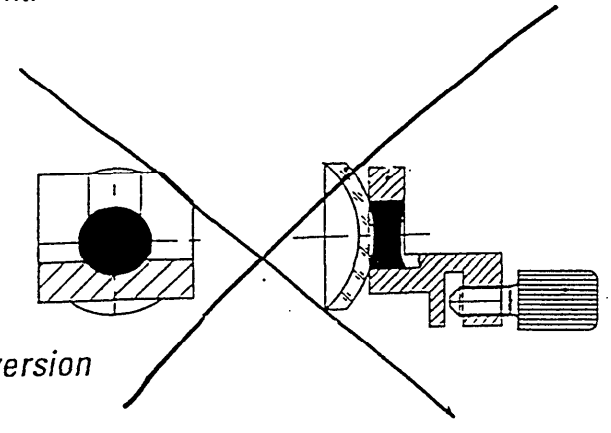
*The improved (second) version has*

*approx. 5 mm cement free area in the center,*



*good improved version*

*where at the old version the whole is completely filled with cement.*



*old version*

Leica AG
Service **SOM/SM**

Klaus Bieniek

Werner Hämmerle

# Changes and modifications

## M680 control unit (MEL61/62) is compatible with M695 surgical microscope

***. . . from control unit serial number 011193001 onwards***

the MEL61/62 can also be used for the M695, provided that earlier lamp control PCBs are subjected to a slight modification. This modification was introduced from March 1993 onwards (Index C on board) (355 980 C).

The functions ZOOM SPEED B, XY-SPEED and POSITION 1/2 are not required for the M695. The positions occupied on the control panel by these switches or potentiometers will be covered over. The covers, and instructions for fitting them, accompany the control unit.

From March 1995 onwards, only the MEL61/62 control unit will be used for the M680 and M695. The previously-used MEL64/65 control unit will no longer be manufactured.

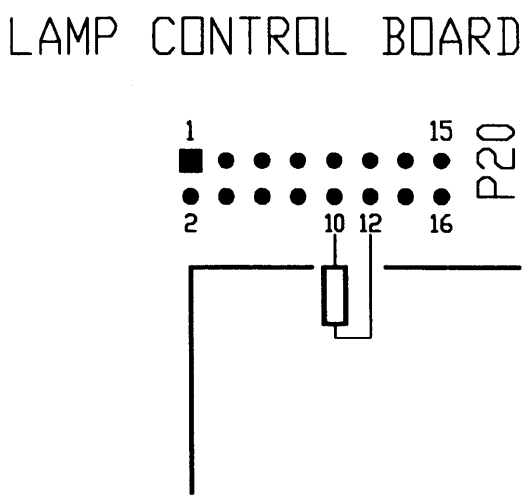
***Modification of the lamp-conbol PCB***

is required if both of the following conditions are met:

1. The MEL64/65 control unit is replaced by an MEL61/62
2. The M695 was despatched before March 1993. The lamp control PCB therefore bears an earlier index than C.

Under these conditions the hand-/footswitches will not react at the control input A or B respectively, depending on the position of the switch "Position 1/2".

***Modification:*** On the soldered side, bridge pins 10 and 12 of P20 with a 100 Ω resistor (1/8W). The resistor shall not come into contact with the housing cover.



# *Preconditions for using this service manual*

***Intended users***

Technical personnel provided by customer or by LEICA agencies, equipped with the testset 566 152 (see Section 18).

***What is expected of the person using the Testset?***

***Stage 1: Allocation of a fault to one of the main groups:***

- ***Footswitch***
- ***Control unit***
- ***Swingarm***
- ***Microscope (optics carrier)***

- You have read the user manual and can operate the surgical microscope

Directions are given in Sections 3 and 4.

***Stage 2: Locating and eliminating errors at module level***

- You have been trained in the basics of electronics and mechanical engineering
- You have been instructed by a technician from your agency or from LEICA AG, HEERBRUGG.

Sections 3,4 and 10

***Stage 3: Locating and eliminating errors at board level***

- You have been trained in the basics of electronics and mechanical engineering
- You have taken part in an M690/M695- or M680 course.

Sections 3 to 9, and Section 11

# To the contents of service manual

***Legal aspects***

This book may only be given to, and used by, certain persons. These are detailed in **Section 1.**

***Changes/ Service News***

Place Service News on top of the M695 in **Section 2.**

***Introduction/ User manual***

CONGRATULATIONS - You are one of those methodical people who also read the important **Section 3** of this manual.

***locating faults with the test set (Test box)***

If a fault develops, **we will** guide you **to** it with **the** assistance of **Section 4** and the test box.

The test set helps you to assign the fault to the:

- Footswitch
- Control unit
- Swingarm
- Microscope

The search is then continued at board level with the assistance of block diagrams and the wiring diagram.

***Control unit MEL64165 Description of function***

The function description in **Section** 5, in conjunction with the wiring diagram, will lead you to the defective board or cable connection. The swingarm is the interface.

***Swingarm***
*Description of function*

The function description in Section 6, in conjunction with the wiring diagram, will lead you to the defective board or cable connection. The swingarm is the interface.

***M680 microscope***
*Description of function*

The function description in **Section 7,** in conjunction with the wiring diagram, will lead you to the defective board or cable connection. The swingarm is the interface.

***Wiring diagram***

**Section 9** contains the wiring diagram, and a description of the positions of the boards and the plug connections.

***Exchanging modules***

**Section 10** includes instructions for exchanging those modules which are available as spare parts.

***Exchanging boards***

**Section 11** includes instructions for exchanging those boards which are available as spare parts.

***Testing procedure***

After modules or boards have been replaced, the instrument must meet specifications. Values and tolerances are laid down in the testing procedure **in Section 12.**

Test set

The test box and service cable, and their circuits, are described in **Section 18.**

***Spare parts***

The spare parts, the exchange of which is described in Sections 8 and 9, are listed in **Section 19.**

### *Special tools*

**Section 20** includes a list of the service equipment which will enable you to carry out the operations described above.

No special tools are required. The components making up the test box include a service handswitch and a service cable which serves to bridge the swingann.

***The M695 User Manual is provided as a separate document.***
***To view it, click on this text.***

## Table of content

# M695 fault finding

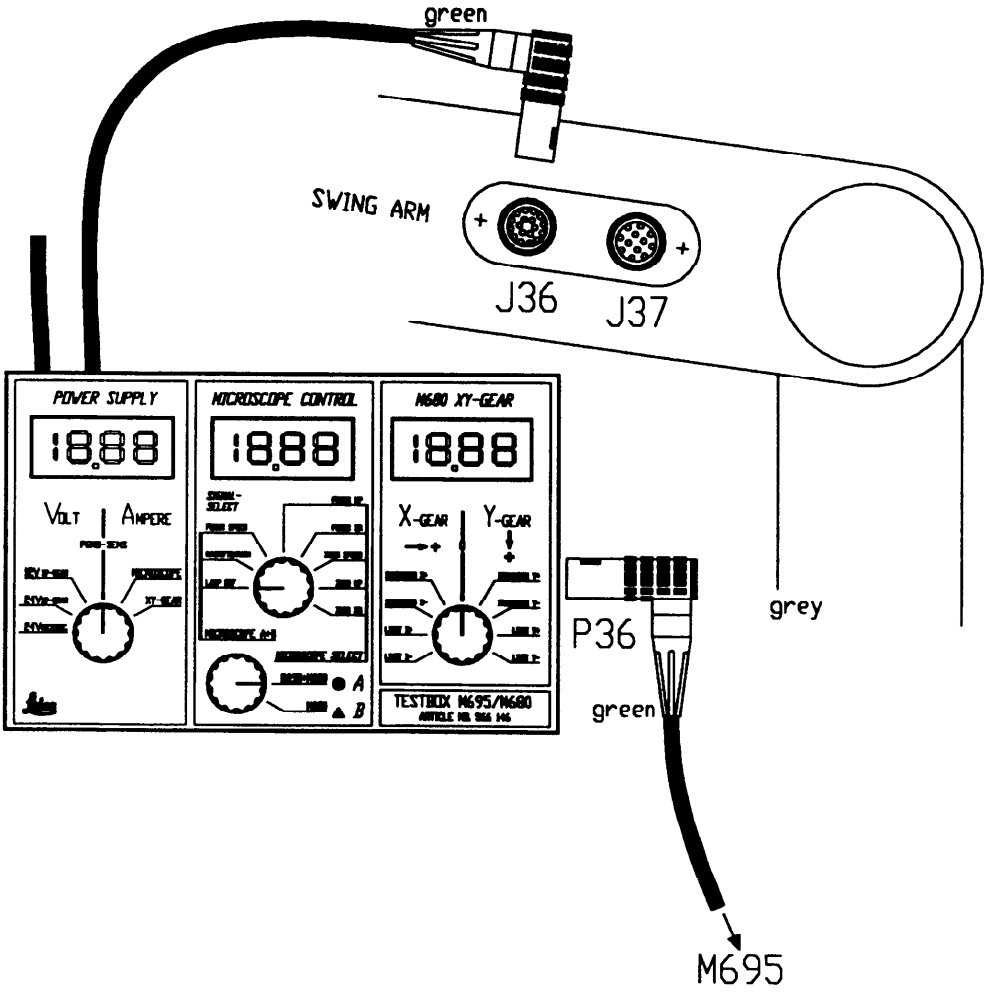

| Chapter | Page |
|---|---|
| Preparation | 4-1 |
| Power supply of control unit | 4-3 |
| Functions of hand- or footswitch | 4-4 |
| Supply of microscope | 4-5 |
| Lamp control | 4-7 |
| Zoom control | 4-8 |
| Focus control | 4-9 |

# M695 Fault finding

## Preparation

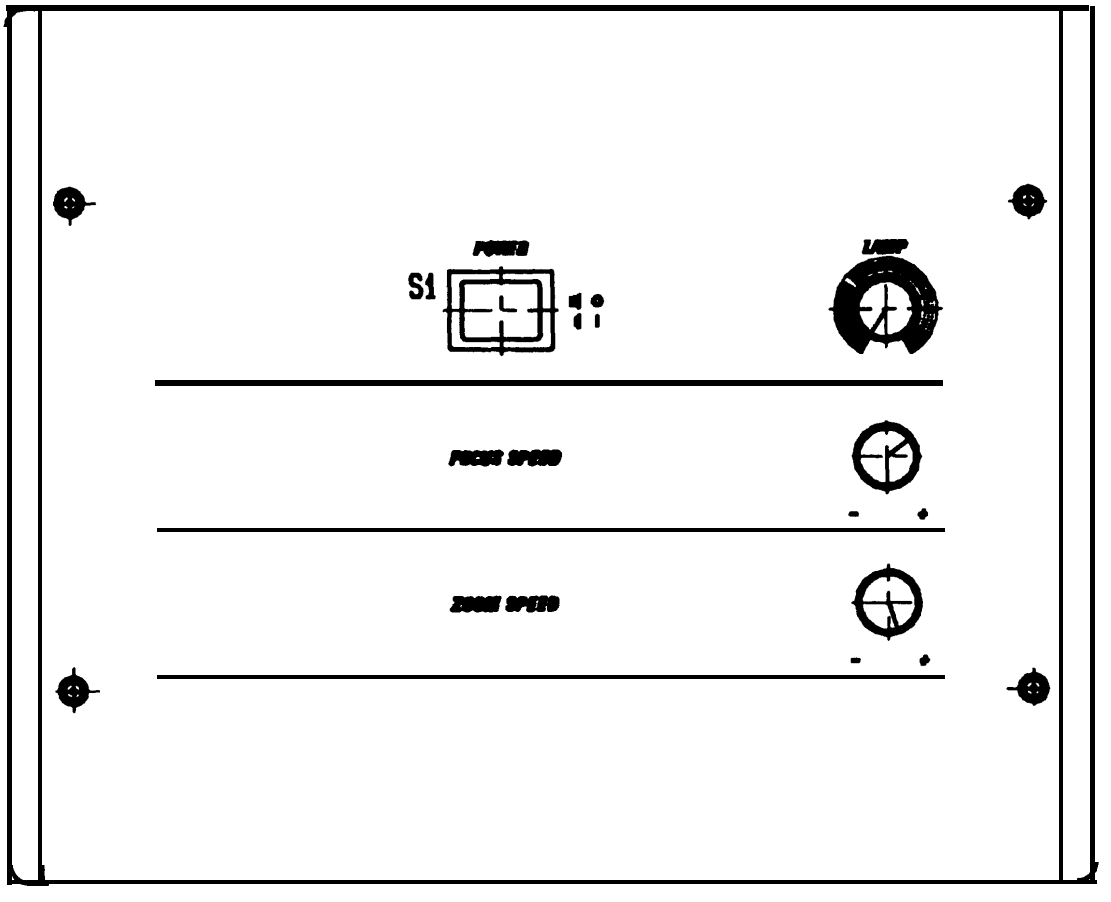
### 1. Connecting the testbox

- Disconnect plug P36 from swingarm
- Hook in the testbox to the swingarm and plug in P36 at the testbox.
- Connect the testbox cable (green sleeve) with J36 at the swingann. With that the control unit is connected with the microscope through the testbox.
- Set switch “MICROSCOPE SELECT” on the testbox to position A.



## 2. Settings on the control unit

- Adjust Lamp to minimal brightness



# Power supply of control unit

| Action | Reaction | Possible reason | Check |
|---|---|---|---|
| **SWITCHING ON** | Lamp of main switch does not light | Line voltage | Fuses F1 and F2 in line plug P1<br>Main switch S1<br>Line cable |
| | 5V-LED on Function-Display does not light | 24V-main supply | Transformer<br>Rectifier circuit<br>Wiring |
| | | 10V-supply | Panel board |
| | | 5V-supply | Receiver board |
| | Focus does not move to center position | Control unit, **Swingarm** or microscope | Focus control page 4-9 |

# *Functions of hand- or footswitch*

***Condition:*** Malfunction of hand- or footswitch of only one of the two CONTROL-inputs, A or B

is disturbed.

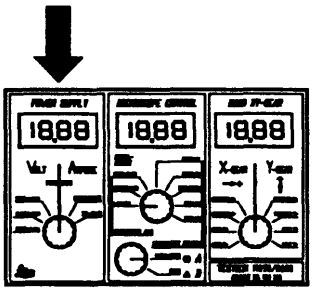
- ***Replace disturbed hand- or footswitch ective side A or B*** by either:

  a) Service-handswitch or

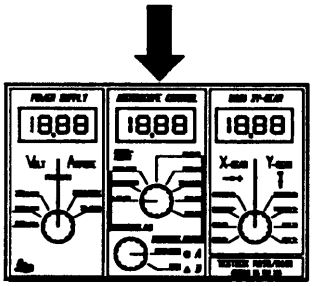
  b) Hand-/footswitch at the other CONTROL-input

| ***Action*** | ***Reaction*** | ***Possible reason*** |
|---|---|---|
| ***Release functions:*** | | |
| SL→ (F)<br>Z↑<br>Z↓<br>F↑<br>F↓ | Corresponding LED at Function Display does not light | Receiver Board |
| ***Connect again original switch*** and ***release functions*** | Corresponding LED at Function Display does not light | Hand- or footswitch |

# Supply of microscope



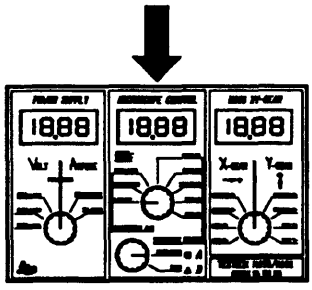
| Voltage | Action | Reading | Reaction | Possible fault |
|---|---|---|---|---|
| 24V MICRO | 1.Lamp to min.brightness<br>2.Lamp to max.brightness<br>3.Lamp back to min. brightness | 26V +-5%<br>20V +-5% | Microscope reacts - but incorrect | Check supply-lines of 24V and check PGND - page 4-6 |
| | | | Microscope without any function | Wiring of microscope |
| | Switch off, bridge swing-arm with servicecable and switch on again | 26V +-5% | microscope reacts | Swingarm cable |
| | Switch off,<br>Separate microscope from testbox and switch on | 26V +-5% | Voltage ok | evtl. short circuit in the microscope |
| | | | Voltage not ok | Control unit |



***Check lines of Powerground PGND***
(Voltage drop on PGND relating to logic ground)

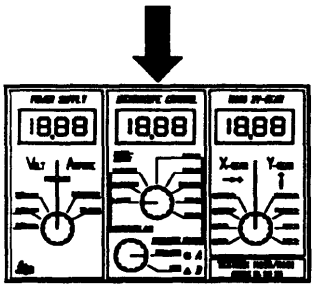
| *Signal* | *Action* | *Reading* | *Reaction* | *Possible fault* |
|---|---|---|---|---|
| ***FOCUS UP*** | Adjust lamp to maximal brightness | max. -0.8W with standard-swingarm cable | If voltage is ok - depending on the incorrect function, check signals of:<br>Lamp control - page 4-7<br>Zoom control - page 4-8<br>Focus control - page 4-9 | |
| | Bridge swingarm with service cable and adjust lamp to max. brightness | max. -0.8V | Voltage ok | Swingarm cable (One of the two PGND-lines is broken) |
| | | | Voltage not ok typ. >-1v | One of the two PGND-lines in the microscope or control unit is broken. |
| | ***Important: Adjust lamp again to minimal brightness!*** | | | |

# Lamp control

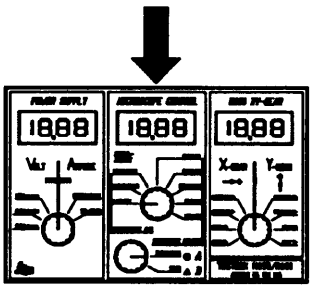


| Signal | Action | Reading | Reaction | Possible fault |
|---|---|---|---|---|
| LAMP REF | Adjust lamp to min./max brightness | 0.3V / 5V +-5% | Voltage ok | Microscope (Lamp Control, Wiring) |
| | Separate microscope from the testbox, adjust lamp to min./max brightness | 0.3V / 5V +-5% | Voltage ok | Microscope |
| | Bridge swingarm with service cable, adjust lamp to min./max brightness | 0.3V / 5V +-5% | Voltage ok | Swingarm cable |
| | | | Voltage not ok | Control unit |
| | **Important: Adjust lamp again to minimal brightness!** | | | |

# Zoom control



| Signal | Action | Heading | Reaction | Possible fault |
|---|---|---|---|---|
| ZOOM SPEED | Set min. zoom speed<br>Set max. zoom speed | 1.84 ... 2.34V<br>5V +-5% | | |
| ZOOM UP | Release Z↑ on hand-/footswitch | >4.75V | 'Voltages ok, but ıreacts incorrect | Microscope (Logic board. Zoom servo, wiring) |
| | non-actuated | <0.2V | | |
| ZOOM DN | Release Z↓ on hand-/footswitch | >4.75v | | |
| | non-actuated | <0.2v | | |
| | Separate microscope from the testbox and check signals | see above | Voltages ok | Microscope (short circuit on Zoom servo or wiring) |
| | Bridge swingarm with servicecable and verify signals | see above | Voltages ok | Swingarm cable |
| | | | Voltages not ok | Control unit |



# Focus control

***Select microscope side A or B:***

- Select A or B, depending on which side the zoom works incorrect
- Select A if the fault appeares on both sides, A and B.

| *Signal* | *Action* | *Reading* | *Reaction* | *Possible fault* |
|---|---|---|---|---|
| ***FOCUS SPEED*** | set min. focus speed<br>set max. focus speed | 1.25 . . . 1.27V<br>5v +-5% | | |
| ***FOCUS UP*** | **Release F↑ on hand-**/footswitch | >4.75V | Voltage ok, but reacts incorrect | Microscope (Focus servo, wiring) |
| | non-actuated | <0.2V | | |
| ***FOCUS DN*** | **Release F↓ on hand-**/footswitch | >4.75V | | |
| | non-actuated | <0.2V | | |
| | Separate microscope from the testbox and check signals | see above | Voltages ok | Microscope (short circuit on Focus servo or wiring) |
| | Bridge swingarm with servicecable and verify signals | see above | Voltages ok | Swingarm-cable |
| | | | Voltages not ok | Control unit |

## Table of content

# Description of functions
# MEL64/65 control unit


| Chapter | Page |
|---|---|
| Introduction | 5-1 |
| Power supply | 5-3 |
| Lamp control | 5-9 |
| Zoom control | 5-11 |
| Focus control | 5-15 |

# Description of functions MEL64/65 control unit

***The description is subdivlded for the main groups:***

- Control unit MEL64/65 - Section 5
- Swingarm MSV136/137 - Section 6
- M695 microscope - Section 7

***The control circuits for zoom, focusing and XY-gear***

are located partly in the control unit and partly in the microscope itself. Their functions are described in the following sections 5 and 7.

***The swingarm cable***

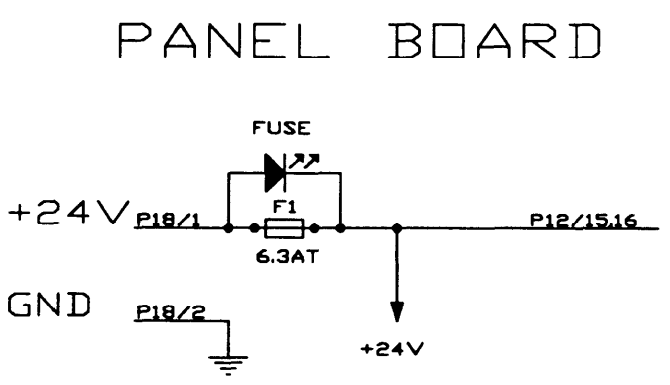
is the electrical link between the control unit and the microscope, and is therefore the ideal place to start looking for faults at the level of the main groups.

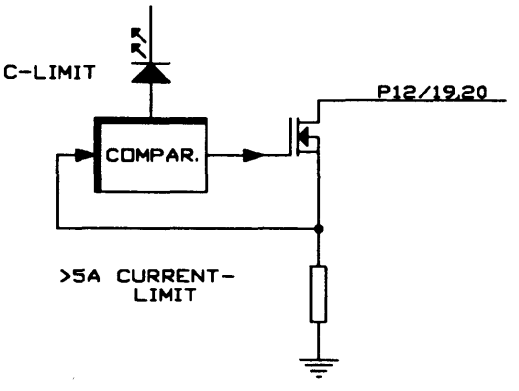
**The test box** is introduced between the swingarm and the microscope. It can be used to study the supply voltages, control signals and control levels, all of which are transmitted through the swingarm cable. Section 6 includes a list of these signals.

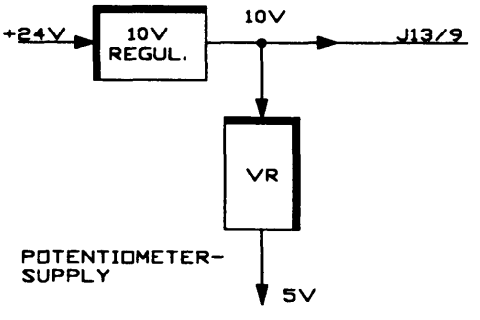
# Notes

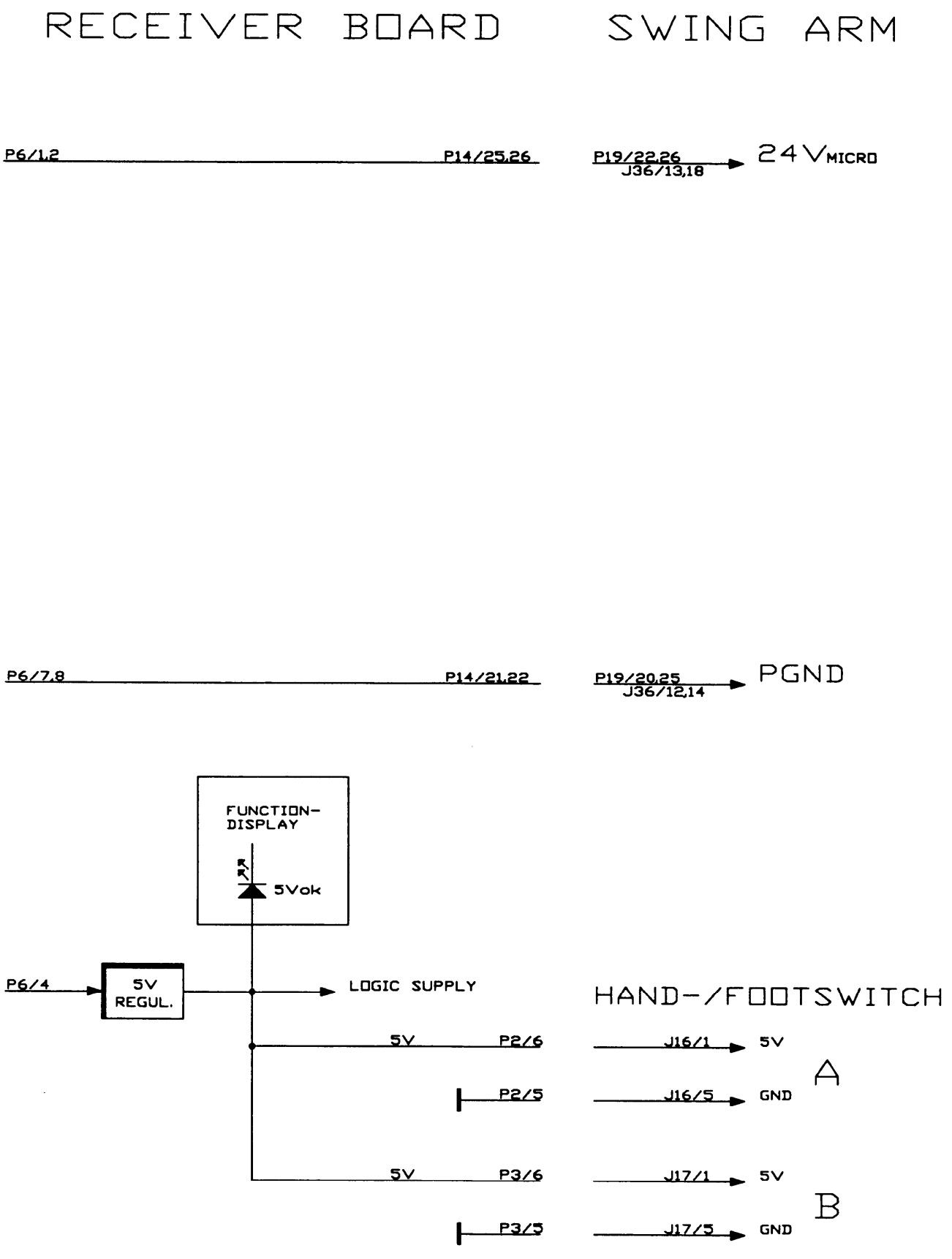
# Power supply MEL64/65

| Tasks | Control elements /displays | Pages |
|---|---|---|
| ***24V supply***<br>for microscope and XY-gear | Red LED on panel board indicates defective fuse | **5-6** |
| ***10V supply***<br>for potentiometer and receiver board | Green LED on panel board shows 10V O K | **5-6** |
| ***5V supply***<br>for logics of receiver board and foots-witch or handswitch | LED “5V” OK on function display | **5-7** |
| ***Ground*** | | |
| ***PGND: Microscope ground*** | Yellow LED on panel board indicates switch-off caused by excess current | **5-7** |
| ***SENS*** | Logics (ground) microscope | **5-7** |
| ***GND_XY: XY ground*** | | |


PANEL BOARD
FUSE
+24V
P18/1
F1
6.3AT
P12/15.16
GND
P18/2
+24V


C-LIMIT
P12/19.20
COMPAR.
>5A CURRENT-
LIMIT


+24V
10V
REGUL.
10V
J13/9
VR
POTENTIOMETER-
SUPPLY
5V


RECEIVER BOARD
SWING ARM
P6/1,2
P14/25,26
P19/22,26
J36/13,18
24VMICRO
P6/7,8
P14/21,22
P19/20,25
J36/12,14
PGND
FUNCTION-
DISPLAY
5Vok
P6/4
5V
REGUL.
LOGIC SUPPLY
HAND-/FOOTSWITCH
5V
P2/6
J16/1
5V
A
P2/5
J16/5
GND
5V
P3/6
J17/1
5V
B
P3/5
J17/5
GND

**Control-LEDs**

*On the panel board:*

**10V OK:** green LED shines
**>5A on 24V (PGND):** yellow LED shines
**Fuse interrupted:** red LED shines

*and on the function display:*

**5V OK:** green LED shines

**24V supply**

The 24V supply powers the servo board via the receiver board, and the microscope via the swingann.

The fuse for the unstabilized main supply voltage is on the panel board (6.3AT). The red LED indicates **a** burnt fuse.

**Limitation of excess current**

The loading at maximum lamp **brightness** is about 3.25A. The yellow LED on the panel board indicates switching off as a result of excess current (5A) at PGND.

**10V supply**

A switching regulator on the panel board reduces the 24V to 10V. The power for the potentiometer (5V) is derived from it. The 5V regulator on the RECEIVER BOARD is supplied with 10V.

***5V supply Receiver board***

An LED on the function display shows 5V OK. The following are supplied with power: Handswitch or f&switch, and logics on receiver board.

***PGND, SENS and logics ground***

Microscope ground (PGND) and SENS are connected in the microscope. The high lamp current produces a voltage drop of about 0.6V at PGND. This voltage is passed to the control unit through SENS.

For the reason indicated above, Logic ground is about 0.6V below PGND in the microscope. The voltage drop at PGND influences the level of the control signals.

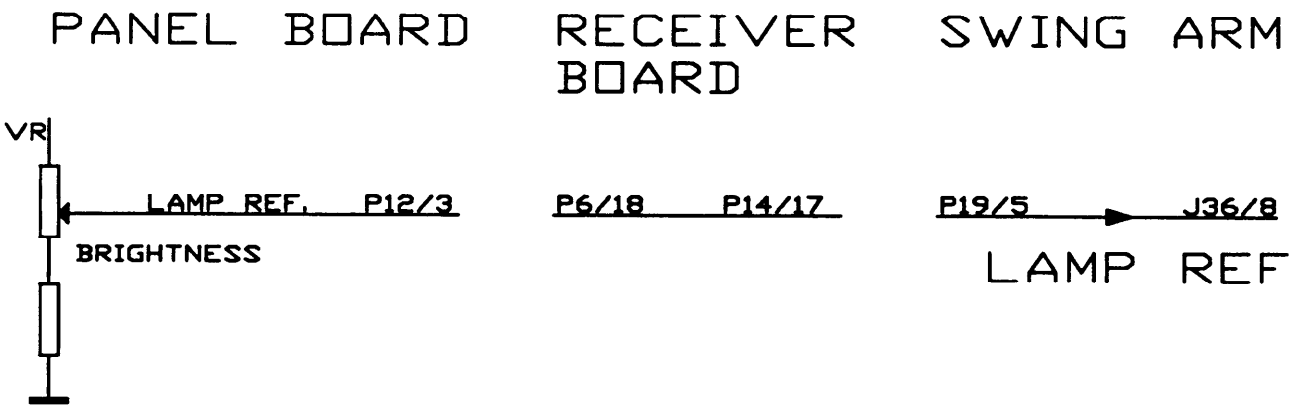
***SENS***

All control signals to the microscope are measured with the testbox in relation to SENS. SENS is connected to GND trough a 20-Ohm resistance at panel board.

# Notes

# Lamp control MEL64/65

| Tasks | Control element/display | Pages |
|---|---|---|
| **Setting the lamp brightness** | Potentiometer on control unit | 5-10,7-3 |
| **Limiting excess current** | Measurement resistor on LAMP CONTROL in microscope | 7-3 |



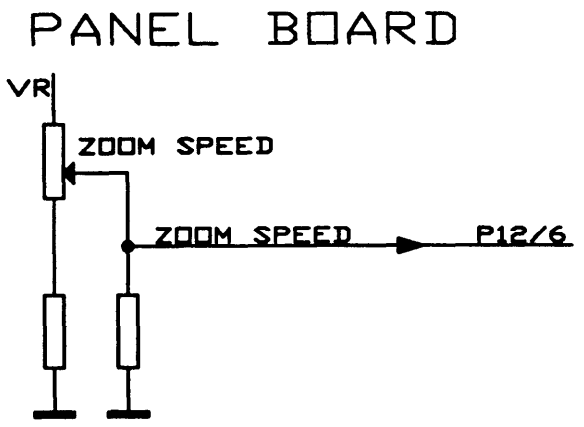

***Reference for lamp regulator***

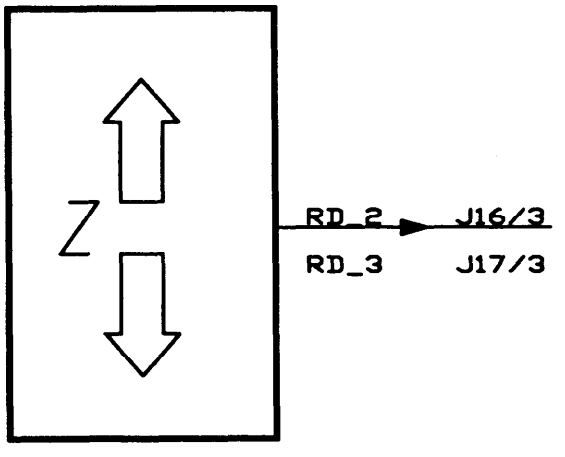
The voltage level LAMP REF depends on the position of the brightness potentiometer. LAMP REF is passed via the receiver board and the swingarm cable to the lamp control board in the microscope, where it forms the reference value (required value) of the lamp regulator.

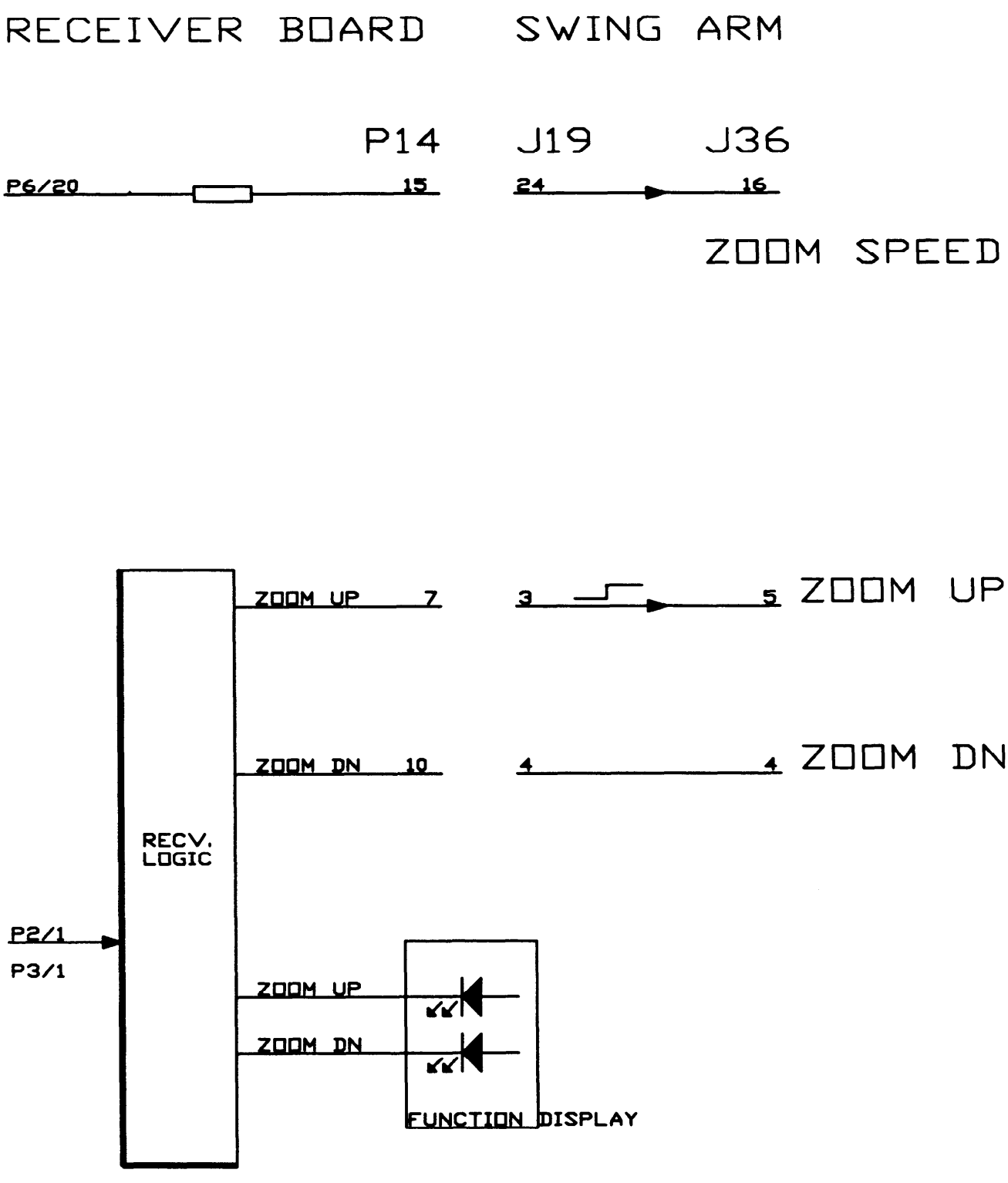
| | *LAMP REFerence* |
|---|---|
| *Min. brightness* | 0.3V +-5% |
| *Max. brightness* | 5.0V +-5% |

# Zoom control MEL64/65

| Tasks | Control elements / display | Page |
|---|---|---|
| **Using motor to set zoom position** | Footswitch or handswitch<br>Function display<br>Up/down-LED on zoom servo | 5-14,7-6 |
| **Presenting zoom adjustment speed** | Zoom speed potentiometer | 5-14,7-8 |


PANEL BOARD
VR
ZOOM SPEED
ZOOM SPEED
P12/6


Z
RD_2
J16/3
RD_3
J17/3


RECEIVER BOARD
SWING ARM
P14
J19
J36
P6/20
15
24
16
ZOOM SPEED
ZOOM UP
7
3
5
ZOOM UP
ZOOM DN
10
4
4
ZOOM DN
RECV.
LOGIC
P2/1
P3/1
ZOOM UP
ZOOM DN
FUNCTION DISPLAY

### Control LEDs

The function display tells you whether the signals from the footswitch or handswitch are being correctly received and interpreted:

Z↑ for ZOOM UP
Z↓ for ZOOM DOWN

### Using the motor to set the zoom position

The handswitch or the footswitch transmits on RD_2 or RD_3 the codes which correspond to the functions:

Data format:

ASCII 8-bit with start bit
repeating at 2.3-millisecond intervals
+5W/-8V

The logics on the receiver board (processor) assign the codes received to their appropriate functions:

ZOOM UP
ZOOM DOWN

The control signals (0V/5V) for ZOOM UP and ZOOM DOWN reach the logics board in the microscope via the swingarm cable.

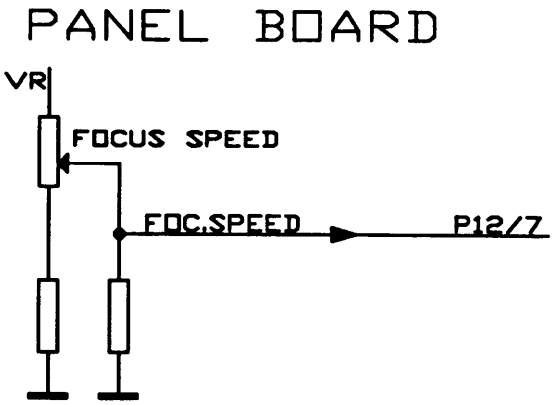
### Presetting the zoom displacement speed

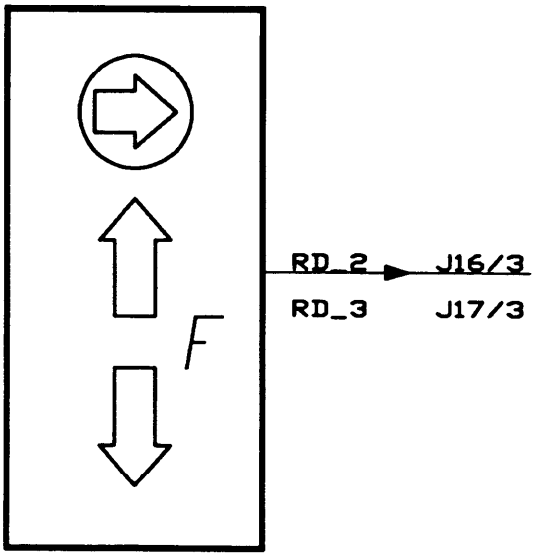
The voltage level of ZOOM SPEED depends on the position of the potentiometer on the panel board.

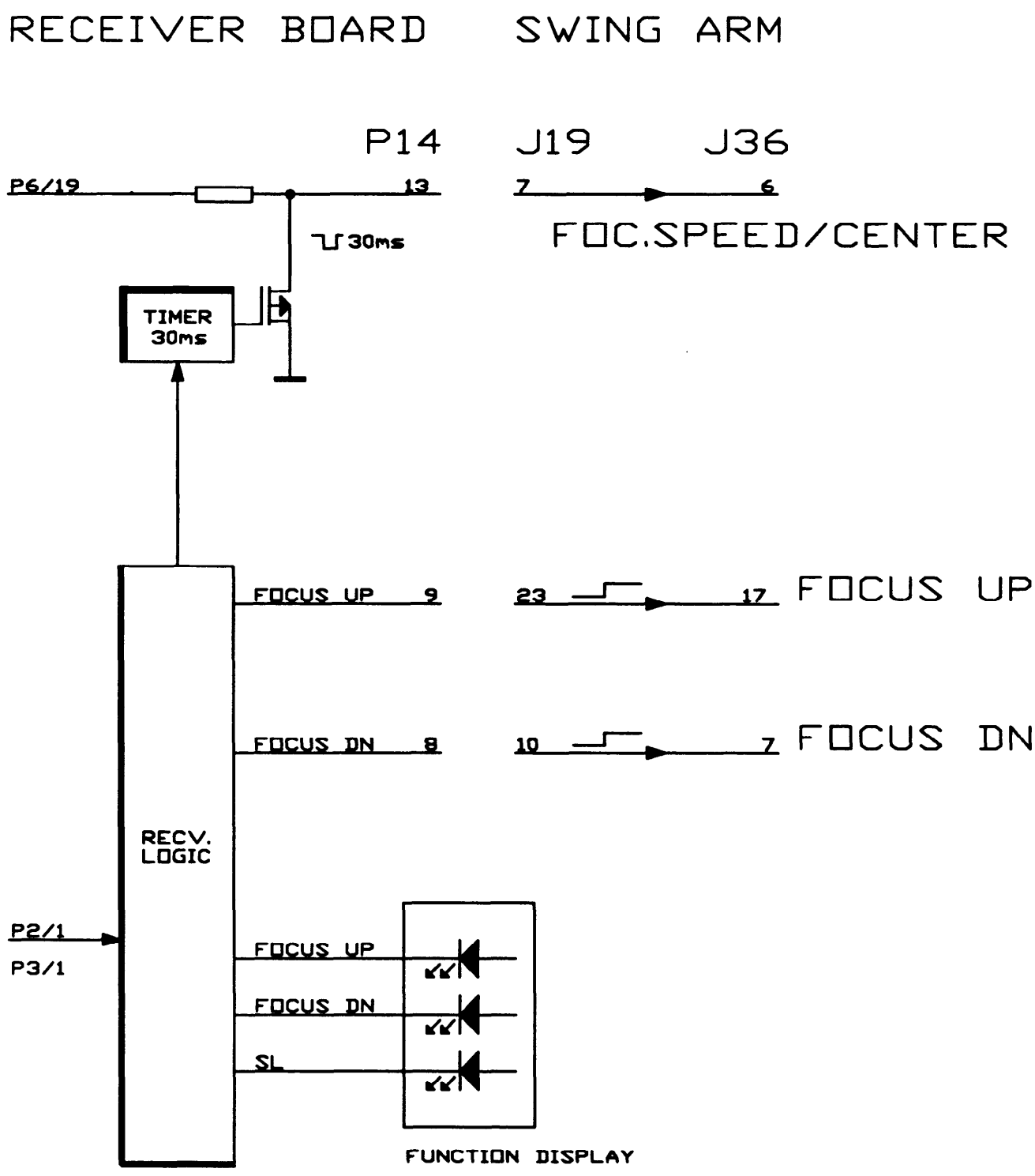
| | *Level of ZOOM SPEED* |
|---|---|
| *min. ZOOM SPEED* | *2.10V +- 0.25V* |
| *max. ZOOM SPEED* | *5V +- 5%* |

# Focus control MEL 64/65

| Tasks | Control elements/display | Pages |
|---|---|---|
| **Motorized focusing** | Footswitch or handswitch<br>Functiondisplay<br>Up/down-LED on focus servo | 5-18,7- |
| **Presetting speed of focusing** | Focus speed potentiometer | 5-18,7- |
| **Travelling to centre position**<br>after switching on or resetting | Footswitch or handswitch<br>Reset switch on motor driven objectiv (MOBxxx) | 5-19,7- |


PANEL BOARD
VR
FOCUS SPEED
FOC.SPEED
P12/7


RD_2
J16/3
RD_3
J17/3
F


RECEIVER BOARD
SWING ARM
P14
J19
J36
P6/19
13
7
6
30ms
FOC.SPEED/CENTER
TIMER
30ms
FOCUS UP
9
23
17
FOCUS UP
FOCUS DN
8
10
7
FOCUS DN
RECV.
LOGIC
P2/1
P3/1
FOCUS UP
FOCUS DN
SL
FUNCTION DISPLAY

### Control LEDs

The function display tells you whether the signals from the footswitch or handswitch are being correctly received and interpreted:

F↑ for FOCUS UP
F↓ for FOCUS DOWN
SL→ for CENTER POSITION

### Motorized focusing

The handswitch or footswitch transmits on RD_2 or RD_3 the codes which correspond to the functions:

Data format:

ASCII 8-bit with start bit
repeating at 2.3-millisecond intervals
+5V/-8V

The logics on the receiver board (processor) assign the received codes to their appropriate functions:

*FOCUS UP*
*FOCUS DOWN*
*CENTER POSITION*

The control signals (0V/5V) for FOCUS UP and FOCUS DOWN reach the logics board in the microscope via the swingarm cable.

### Presetting the focusing displacement speed

The voltage level of FOCUS SPEED depends on the setting of the potentiometer on the panel board.

| | *min. FOCUS SPEED* | *max. FOCUS SPEED* |
|---|---|---|
| *Zoom position 25* | 0.5V-0.7V | 2.1V +-5% |
| *Zoom position <8* | 1.25V-1.7V | 5V +-5% |

### Travelling to mid-position

This function is activated from the handswitches or footswitches A and B, using the key (SL->). A timer (Monoflop) sets FOCUS SPEED to GND potential for about 30 milliseconds, using a transistor.

The impulse is recognized on the focus servo in the motor driven objectiv (MOBxxx), and the system is steered to the mid-position.

# Notes

## *Table of content*

# *List of signals for swingarm MSV136/137*

| Chapter | Page |
|---|---|
| Power supply | 6-1 |
| Microscope control | 6-3 |

# List of signals for swingarm MSV 136/137

***Required values for standard two-metre swingarm cable***

- Unless otherwise indicated, set the lamp to minimum brightness, because the values quoted are only valid under these conditions.

## *Power supply*

| *SIGNAL* | *CONDITIONS* | *VALUE* | *TOL.* |
|---|---|---|---|
| **24V$_{MICROSCOPE}$** | Voltage against PGND<br>Lamp min. brightness -> | **26V** | **+-5%** |
| | Voltage against PGND<br>Lamp max. brightness -> | **20V** | **+-5%** |
| **PGND** | Voltage against SENSE<br>Lamp min. brightness -> | -50mV | |
| | Voltage against SENSE<br>Lamp max. brightness -> | **-250mV** | |
| | Voltage drop against logics level<br>Lamp min. brightness: -><br>(Test box: Microscope<br>Setting: Focus up) | **4.9V** | **-0.2v** |
| | Voltage drop against logics level<br>Lamp max. brightness -><br>(Test box: Microscope<br>Setting: Focus up) | 4.2V | **-0.8V** |

| | | |
|---|---|---|
| **Current consumption Microscope** | Lamp min. brightness → | 150mA |
| | Quick-change lamp mount disengaged→ | 50mA |
| | Lamp max. brightness<br>Guiding value→ | 3.5A |

## Microscope control

All signals are measured against SENSE

**Unless otherwise indicated, set the lamp to minimum brightness**

| *SIGNAL* | *CONDITIONS* | *VALUE* | *TOL.* |
|---|---|---|---|
| LAMP REF | Lamp min./max. brightness | 0.3...5V | +-5% |
| FOCUS SPEED | Min./Max. | 1.25...1.7V / 5V | +-5% |
| FOCUS UP | Low/High | <0.2V / >4.75V | |
| FOCUS DN | Low/High | <0.2V / >4.75V | |
| ZOOM SPEED | min./max. | 1.84...2.34V / 5V | +-5% |
| ZOOM UP | Low/High | <0.2V / >4.75V | |
| B ZOOM DN | Low/High | <0.2V / >4.75V | |

# *Table of content*

## *Description of functions M695 microscope*

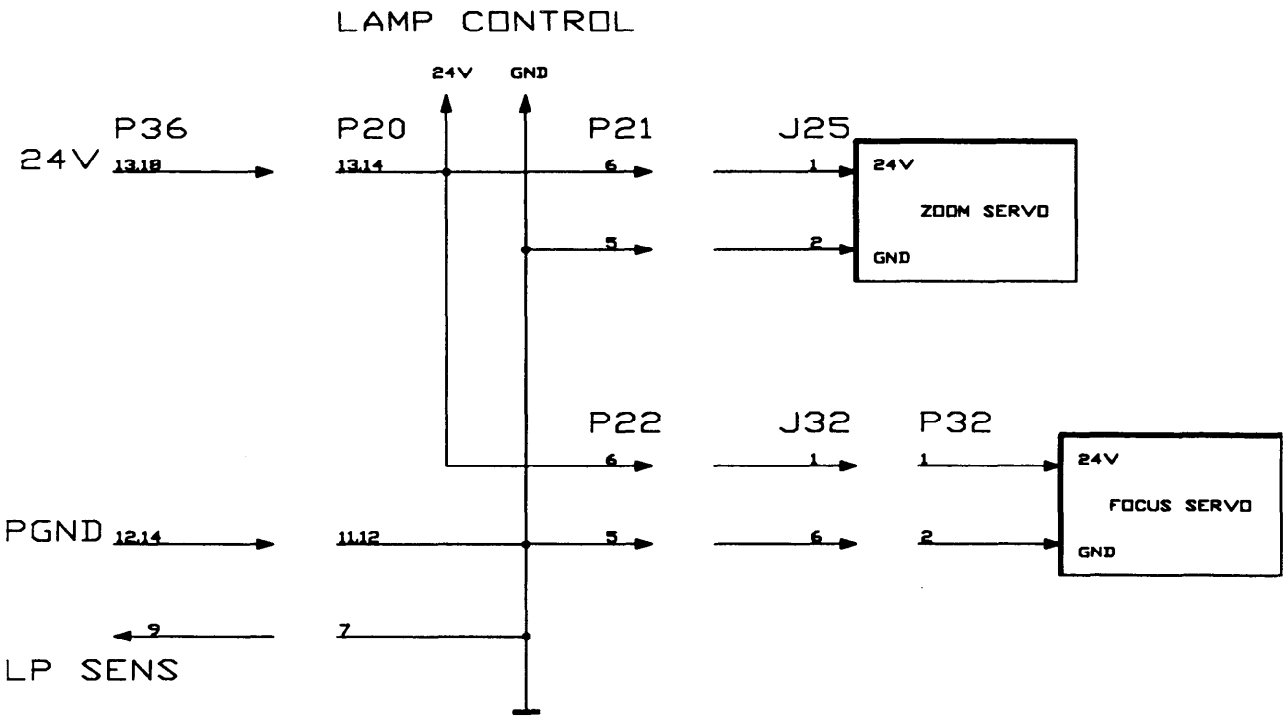
| Chapter | Page |
|---|---|
| Power supply | 7-1 |
| Lamp control | 7-3 |
| Zoom control | 7-5 |
| Focus control | 7-9 |

# Power Supply

## M695 microscope

For functions of control unit, refer to page 5-3

| Tasks | Page |
|---|---|
| 24V-Supply | 7-2 |
| Ground PGND, SENS | 7-2 |




***24V supply***

**Lamp Control**
**Zoom Servos A+B**
**Focus Servos A+B and**

The final stages for lamp, zoom- and focusing motor, is supplied with 24V on these boards, via switching regulators.

***PGND, SENS and Logics-Ground***

Microscope-Ground (PGND) and SENS are linked within the microscope. The high lamp current causes a voltage drop of about 0.6V to PGND. This voltage is passed to the control unit through SENS.

***Situation up until July 1993 ...***

For the reason indicated above, Logics-Ground is about 0.6V below PGND in the microscope. The voltage drop at PGND affects the level of the control signals, and so longer swingarm cables than the standard ones can result in malfunctioning.

***New situation as from August 1993***

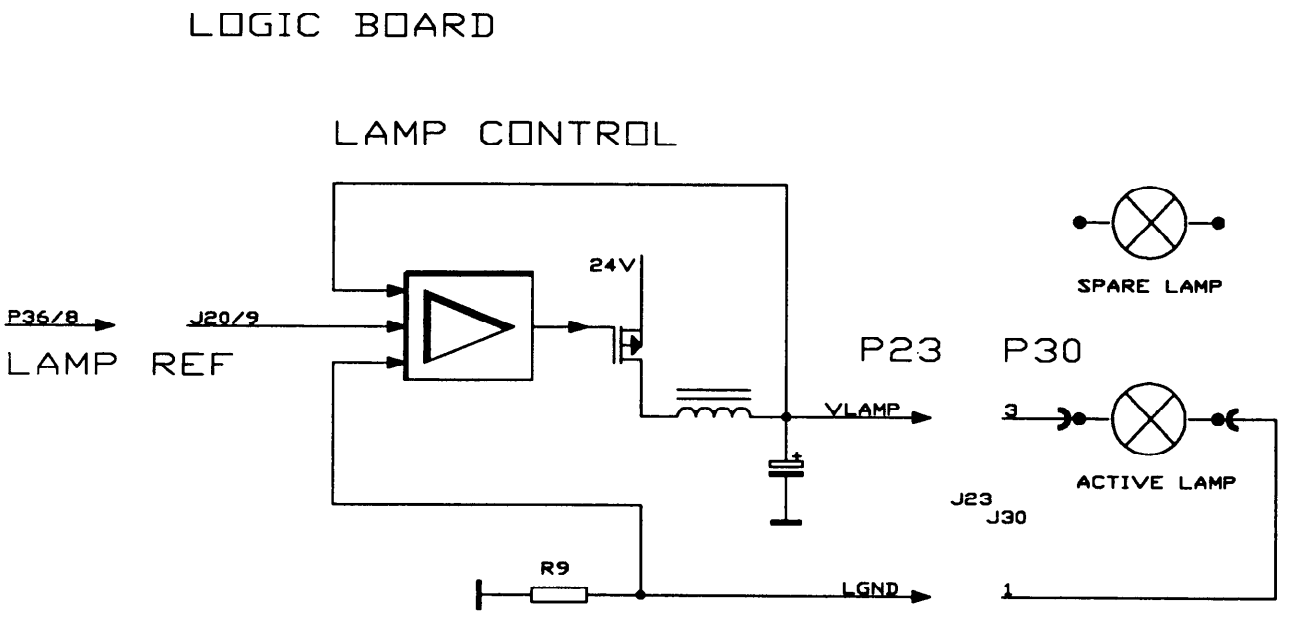
Logics-Ground in the control unit is connected to SENSE and so is partly dependent on PGND. The effect on the control signals is therefore less and longer swingarm cables can be used.

# Lamp control

## M695 microscope

For functions of control unit, refer to page 5-9

| Tasks | Control elements / displays | Page |
|---|---|---|
| **Setting the lamp brightness** | Control unit | **7-4** |
| **Limiting the excess current** | Measuring resistor on LAMP CONTROL | **7-4** |




***Adjusting the lamp brightness***

A pulse-width modulator, dependent on the level of LAMP REF. controls the final-stage transistors. The voltage is smoothed with chokes and electrolytic condensers and the electricity is conducted to the lamp.

The secondary voltage is compared with the required value (LAMP REF) at the entrance of the regulator.

***Limiting the excess current***

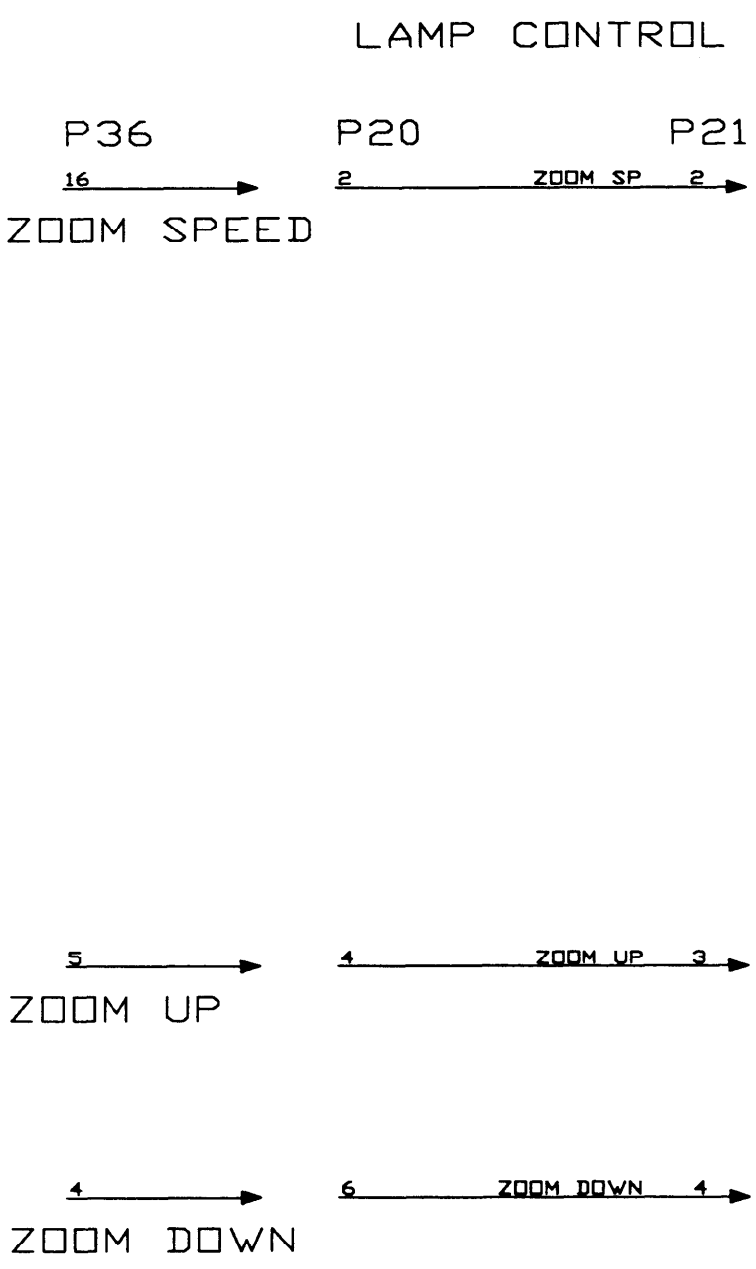
The lamp current produces a voltage drop across resistor R9 in Lamp-Ground (LGND). The regulator measures this voltage drop and limits the current to 5A during the final stage.

# Zoom control

*M695 microscope*

For functions of control unit, refer to page 5-11

| Tasks | Control elements /displays | Page |
|---|---|---|
| **Setting zoom position with motor** | LEDs:<br>ZOOM UP + DOWN | 7-6 |
| **Recognizing end of range** | Light barriers on ZOOM SERVO | 7-7 |
| **Presetting zoom displacement speed** | Control unit | 7-8 |



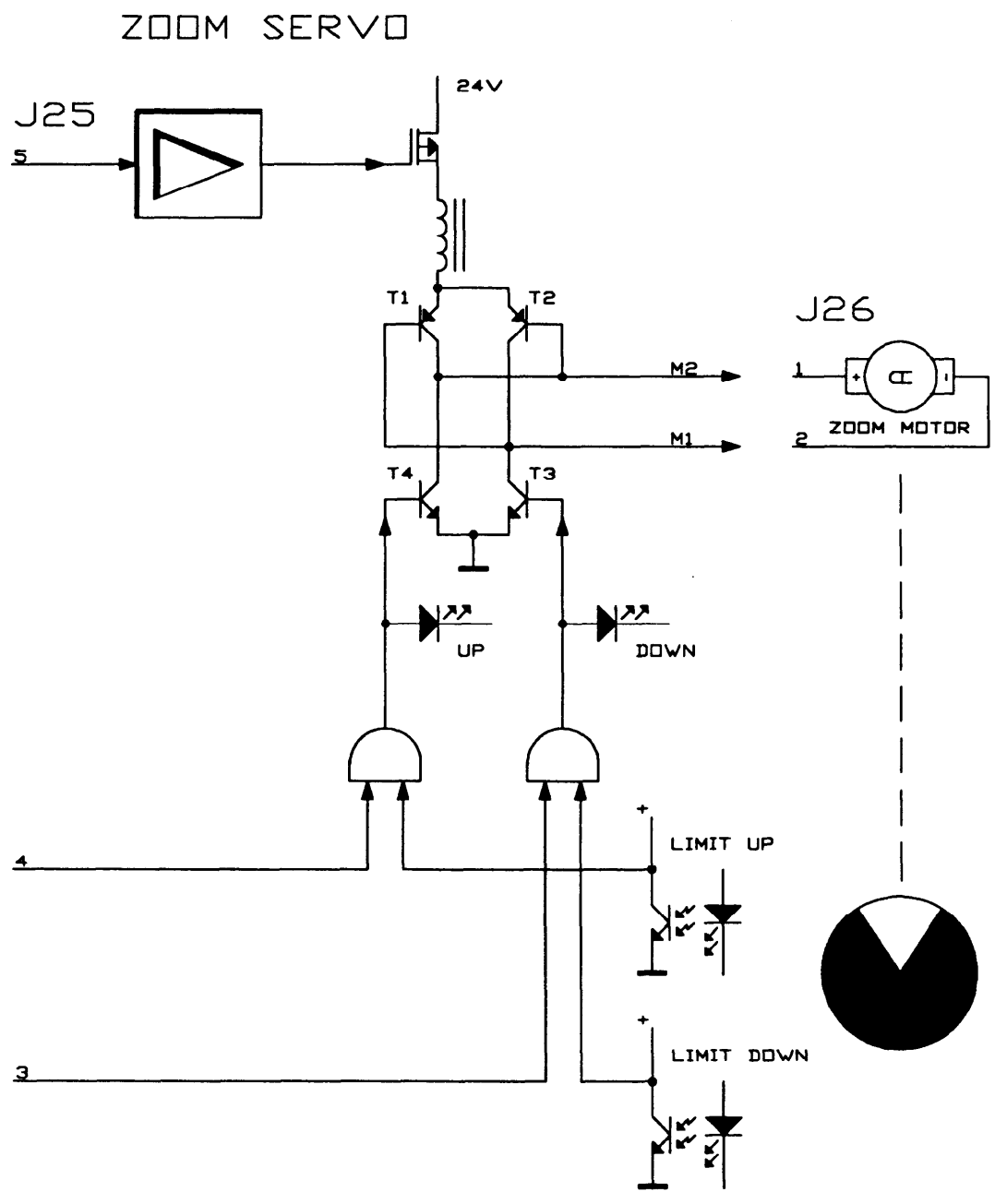

***Control LEDs***

Yellow LEDs on the zoom servo board for the signals

ZOOM UP
ZOOM DOWN

***Using motor to set zoom position...***

The control signals (0V/5V) for ZOOM UP and DOWN reach the zoom board via the swingarm cable and lamp control board in the microscope. ZOOM UP/DOWN activates the final-stage transistors on the zoom servo board. The end-stage comprises a bridging circuit of transistors. In accordance with the direction of displacement the transistors are activated by two: T1 and T3, or T2 and T4.




***Recognizing end of range***

An encoder disk rotates with the zoom gear. The white field on the disk is marking the limit area. It is sensed by two light barriers located on the zoom servo.

If one of both light barriers senses the white field, through a gate the transistor bridge is blocked for that direction of displacement.

***Before removing the encoder disk:*** Mark the disks position at its flange. The adjustment of the disk is described in section 11 - “Replacing boards” (Zoom servo).

### Presetting the zoom displacement speed

The displacement speed is adjusted by means of the supply voltage for the zoom motor. The final stage only has a switching function. The ZOOM SPEED level is the reference for the voltage regulator on the zoom servo board.

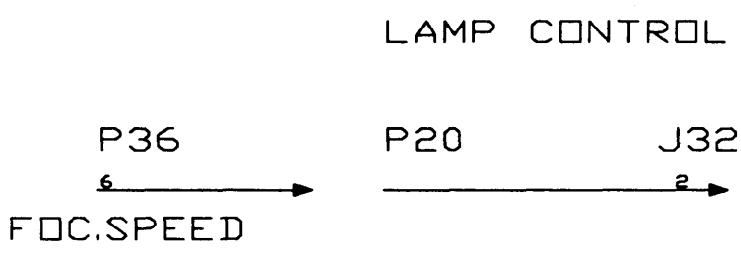
The regulator has a positive current feedback, and so the motor voltage increases with the load. The current through the final stage is limited to about 150mA.

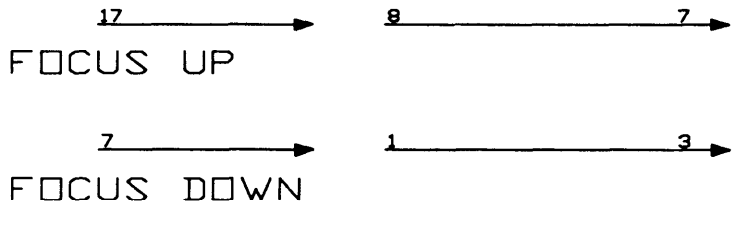
# Focus control

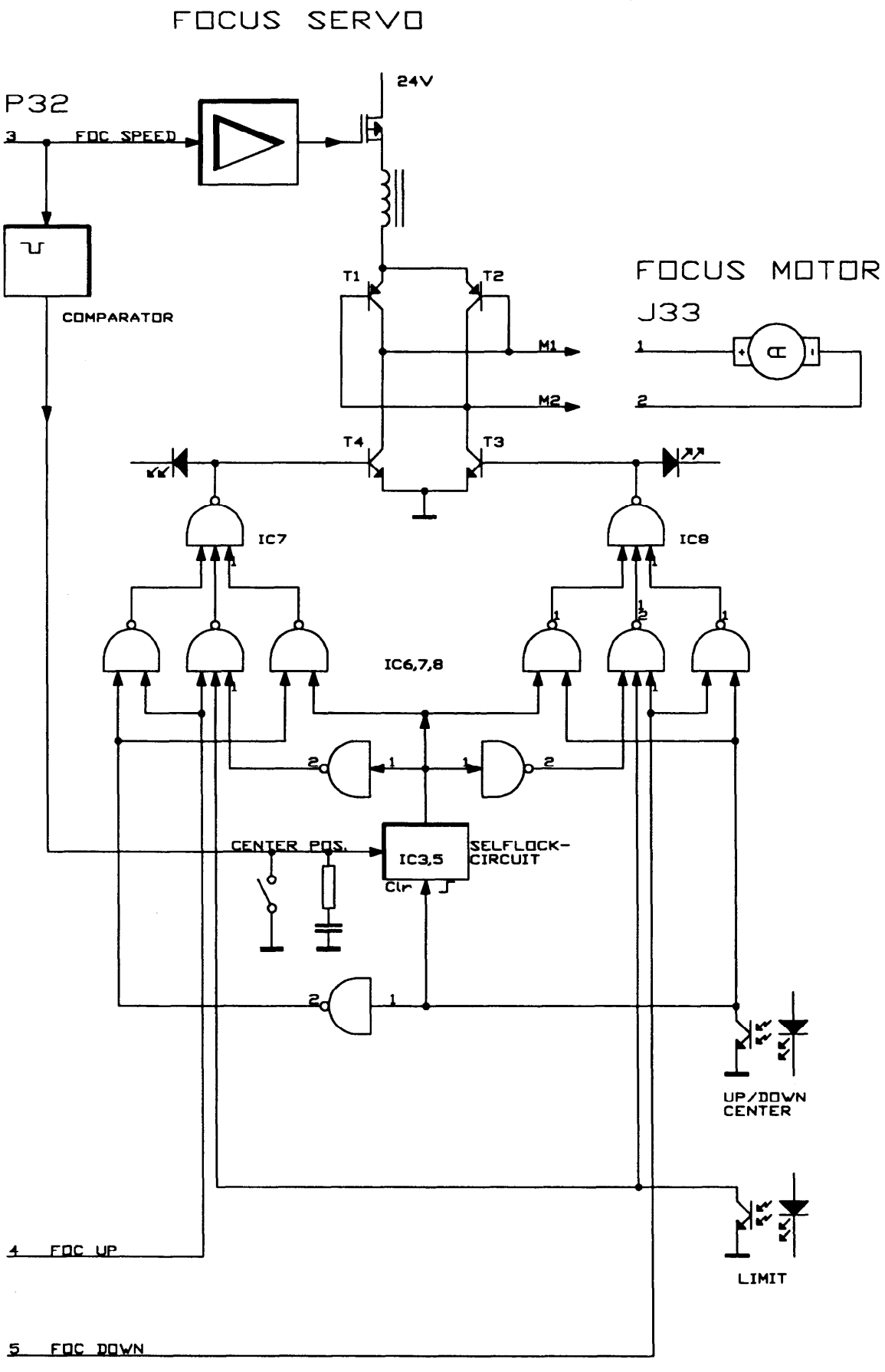
*M695 microscope*

For functions of control unit, refer to page 5-15

| Tasks | Control elements /displays | Page |
|---|---|---|
| **Motorized focusing** | Control unit | 7-12 |
| **Recognizing end of range** | Light barriers on FOCUS SERVO | 7-12 |
| **Presetting the focus displacement speed** | Control unit | 7-12 |
| **Travelling to the mid-polnt** | Focus reset switch<br>Control unit | 7-12 |


LAMP CONTROL
P36
P20
J32
6
2
FOC.SPEED


17
8
7
FOCUS UP
7
1
3
FOCUS DOWN


FOCUS SERVO
P32
3
FOC SPEED
24V
COMPARATOR
T1
T2
T4
T3
M1
M2
FOCUS MOTOR
J33
1
2
IC7
IC8
IC6,7,8
CENTER POS.
IC3,5
SELFLOCK-
CIRCUIT
Clr
UP/DOWN
CENTER
LIMIT
4 FOC UP
5 FOC DOWN

### Motorized focusing

The control signals (0V/5V) for A/B FOCUS UP and A/B FOCUS DOWN pass through the swingarm cable and the Lamp Servo to reach Zoom Servo at the microscope. ZOOM UP/DOWN activates the end-stage transistors in the zoom servo board. The end-stage consists of a bridging circuit of transistors, and so the motor can drive the focusing mechanism in both senses of rotation.

### Recognizing end of range

Reflexive light barriers sense 2 encoder tracks at the circumference of the focus gear: UP/DOWN+CENTER and LIMIT.

With the light barrier UP/DOWN, through gate 2 or 5, the direction of the arrived limit position is decoded. Through gate 2 or 5 LIMIT blocks FOCUS UP or DOWN at the following NAND-gate. The final stage is then blocked for that direction.

### Presetting the focus displacment speed

The displacement speed is altered with the supply voltage for the focus motors. The final stage only has a switching function. The FOCUS SPEED level is the reference for the voltage regulator on the focus servo board.

The current through the final stage is limited to about 140mA.

### Travelling to the mid-position

Triggered by:

- Pressing key “Center Position” at the focusing unit
- Switching on the microscope.
- 30ms-pulse to FOCUS SPEED from control unit. The comparator recognizes when FOCUS SPEED is at GND potential.

The following functions are activated as a result:

1. The selflock circuit is triggered. Gate 2 and 5 block FOCUS UP and DOWN to the final stage. The voltage supply for the focusing motor is switched to maximal speed.

2. Lightbarrier UP/DOWN+CENTER senses, at which side from mid-position the focus gear is staying. Through gate 3 or 4 the final stage is controlled - the motor drives the focus gear toward mid-position...

3. ...until the light barrier on the sensor board detects the crossing from dark to bright at mid-position. The selflock cicuit is reset (Clr) - the motor stops.

# *Referenz auf Steckverbinder*
# *Reference to connectors*

Wo im Instrument die Steckverbindungen zu finden sind erfahren Sie anhand dieser Liste und der nachfolgenden Seiten.

The location of connectors is shown by the list, referring to following pages.

| Steckverb.<br>Connector | Seite<br>Page | Einheit<br>Unit |
|---|---|---|
| **P1** | **9-4,9-5.9-6** | Steuergerät - Control unit MEL64/65 |
| **JP2** | **9-6** | Steuergerät - Control unit MEL64/65 |
| **JP3** | **9-6** | Steuergerät - Control unit MEL64/65 |
| **JP6** | **9-6** | Steuergerät - Control unit MEL64/65 |
| **JP7** | **9-6** | Steuergerät - Control unit MEL64/65 |
| **JP8** | **9-6** | Steuergerät - Control unit ME!L64/65 |
| **JP9** | **9-6** | Steuergerät - Control unit MEL64/65 |
| **JP12** | **9-7** | Steuergerät - Control unit MEL64/65 |
| **JP14** | **9-6** | Steuergerät - Control unit MEL64/65 |
| **J16** | **9-4.9-5,9-6** | Steuergerät - Control unit MEL64/65 |
| **J17** | **9-4,9-5,9-6** | Steuergerät - Control unit MEL64/65 |
| **JP18** | **9-7** | Steuergerät - Control unit MEL64/65 |
| **J19** | **9-4,9-5,9-6** | Steuergerät - Control unit MEL64/65 |
| **P19** | **9-8** | Schwenkarm - Swingarm MSV 136/137 |
| **JP20** | **9-10** | Mikroskop - Microscope M695 |
| **JP21** | **9-10** | Mikroskop - Microscope M695 |
| **JP22** | **9-10** | Mikroskop - Microscope M695 |

| Steckverb.<br>Connector | Seite<br>Page | Einheft<br>UnIt |
|---|---|---|
| **JP23** | 9-10 | Mikroskop - Microscope M695 |
| **JP25** | 9-11 | Mikroskop - Microscope M695 |
| **JP26** | 9-11 | Mikroskop - Microscope M695 |
| **J27** | 9-4,9-5,9-6 | Steuergerät - Control unit MEL64/65 |
| **JP30** | 9-11 | Mikroskop - Microscope M695 |
| **J32** | 9-12 | Mikroskop - Microscope M695 |
| **P32** | 9-10 | Mikroskop - Microscope M695 |
| **JP33** | 9-12 | Mikroskop - Microscope M695 |
| **J36** | **9-9** | Schwenkarm - Swingam MSV136/137 |
| **P36** | 9-10 | Mikroskop - Microscope M695 |
| **J37** | 9-9 | Schwenkarm - Swingarm MSV136/137 |

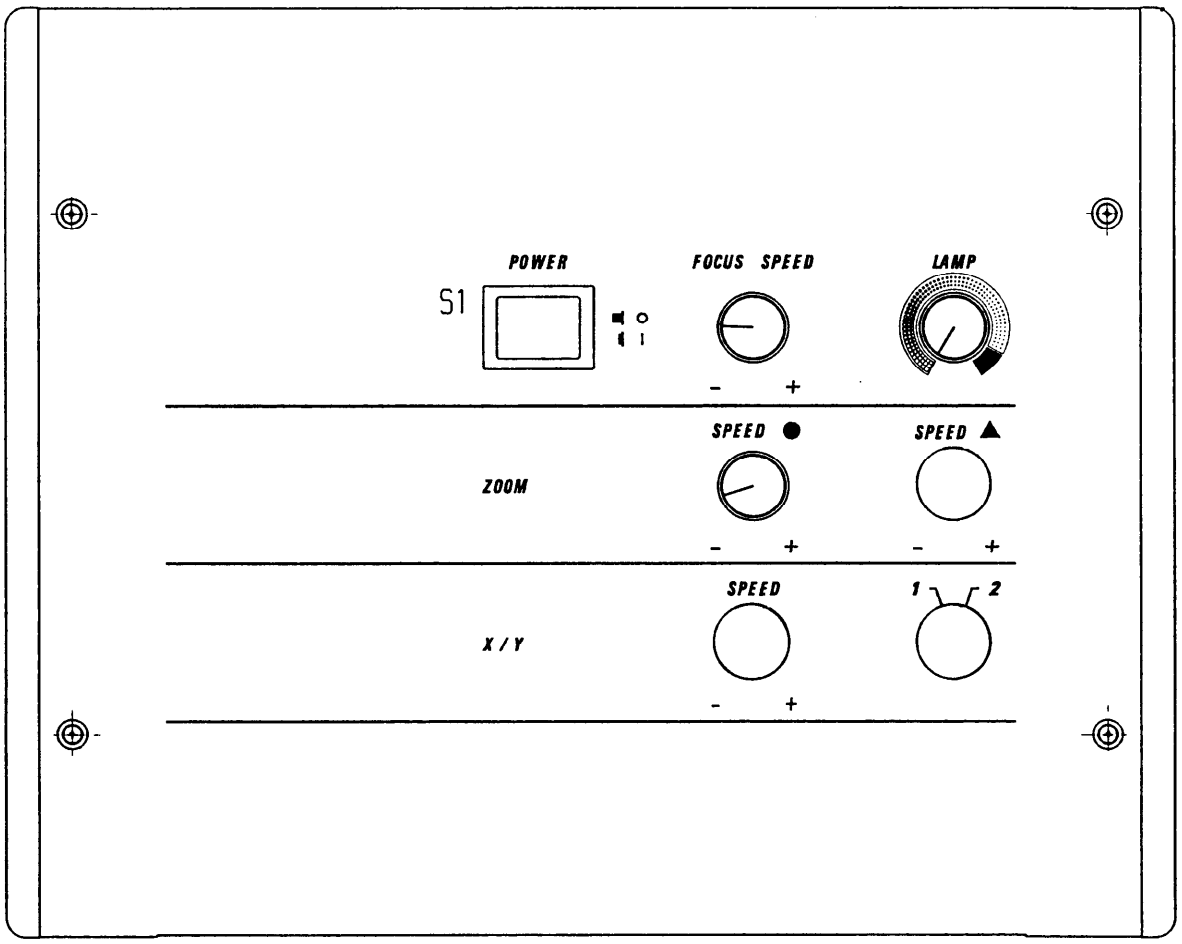
# *Referenz auf Boards*
# *Reference to boards*

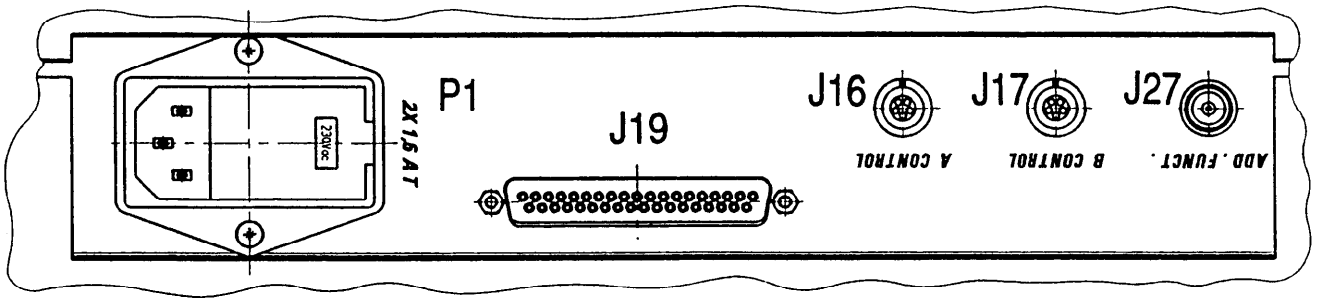
Boards finden Sie anhand der Liste und der nachfolgenden Abbildungen.

The location of boards is shown by the list, referring to following pages.

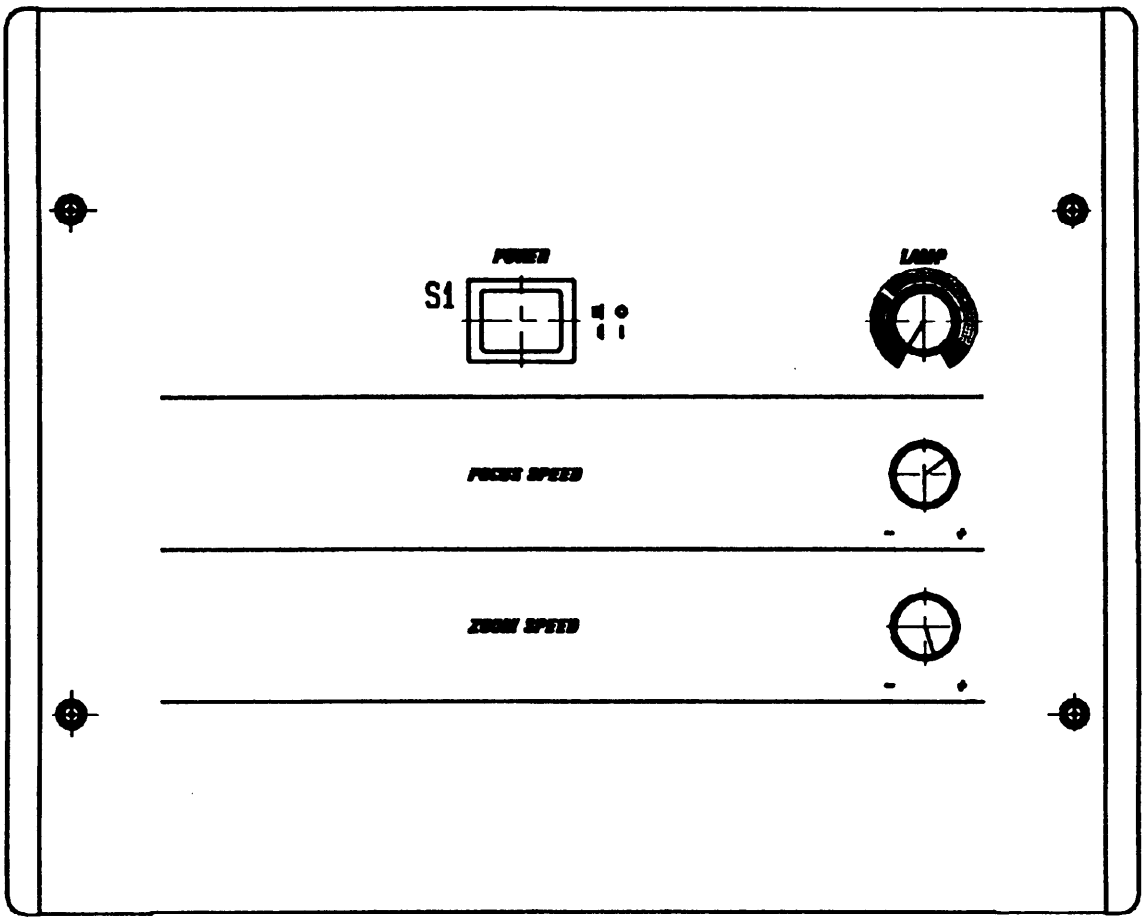
| Board | Seite<br>Page | Einheit<br>Unit |
|---|---|---|
| **Focus Servo** | **9-12** | Mikroskop - Microscope M695 |
| **Function Display** | **9-6** | Steuergerät - Control unit MEL61/62, MEL64/65 |
| **Lamp Control** | **9-10** | Mikroskop - Microscope M695 |
| **Panel Board** | **9-7** | Steuergerät - Control unit MEL61/62, MEL64/65 |
| **Receiver Board** | **9-6** | Steuergerät - Control unit MEL61/62, MEL64/65 |
| **Zoom Servo** | **9-11** | Mikroskop - Microscope M695 |
| **XY Servo Board** | **9-6** | Steuergerät MEL61/62 - Control unit MEL61/62<br>keine Funktion im M695 - no function with M695 |

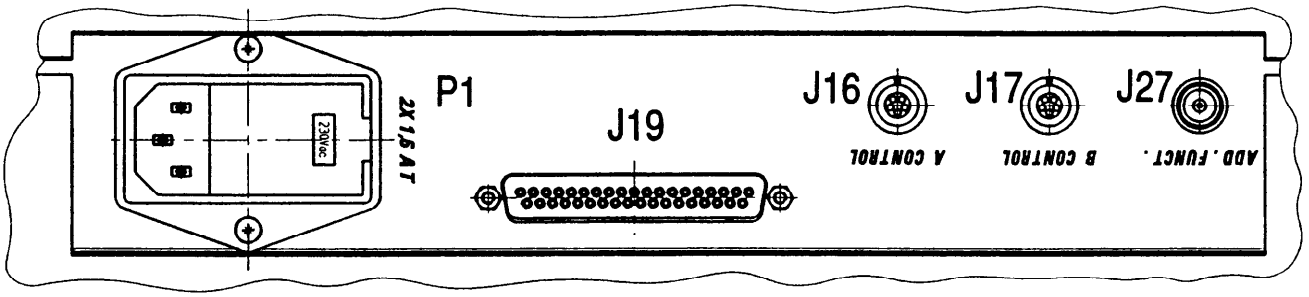
***Steuergerät MEL61/62*** - *Anschlussplatte*
***Control unit MEL61/62*** - *Connector panel*



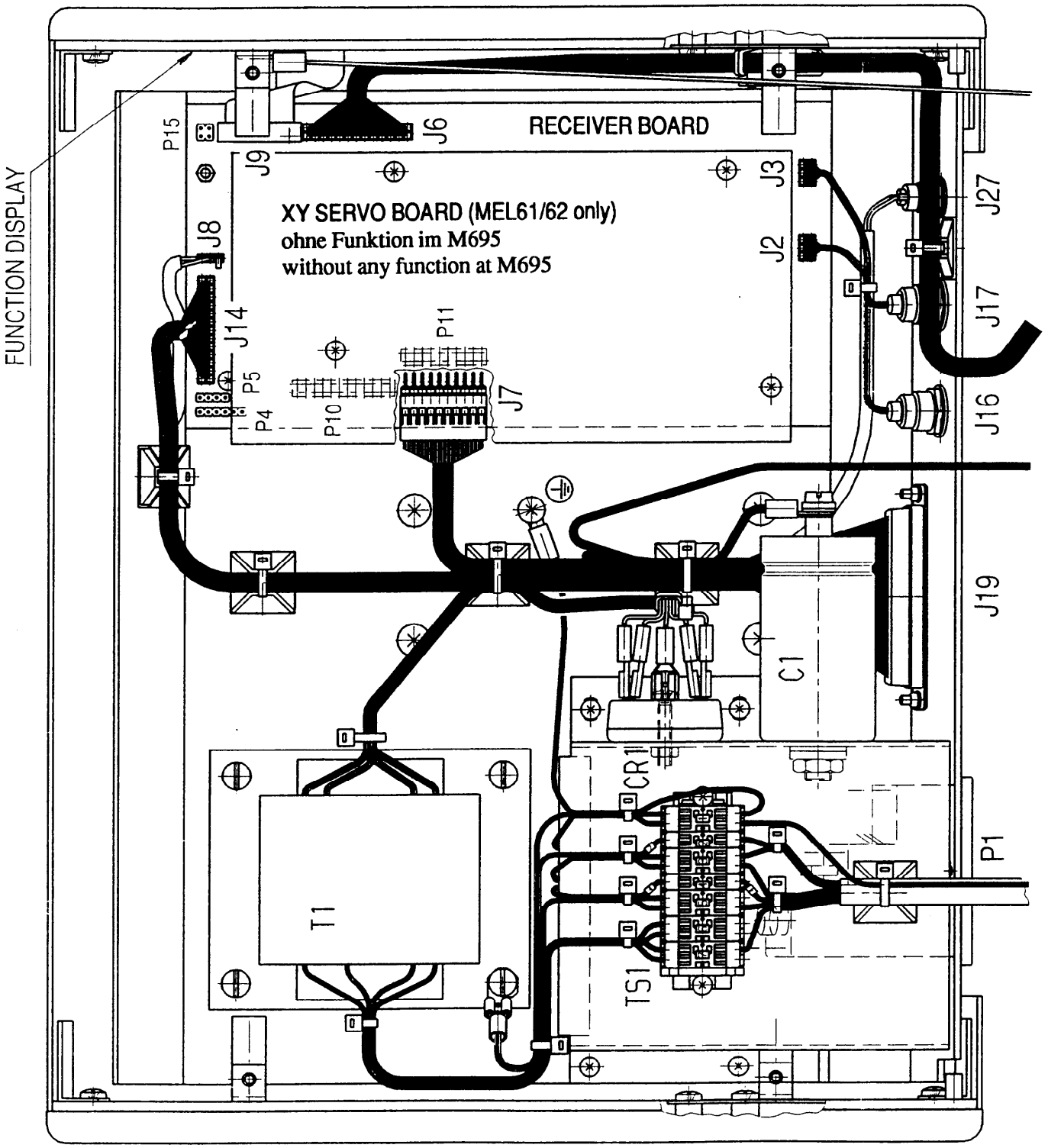



***Steuergerät MEL64/65*** *- Anschlussplatte*
***Control mit MEL64/65*** *- Connector panel*

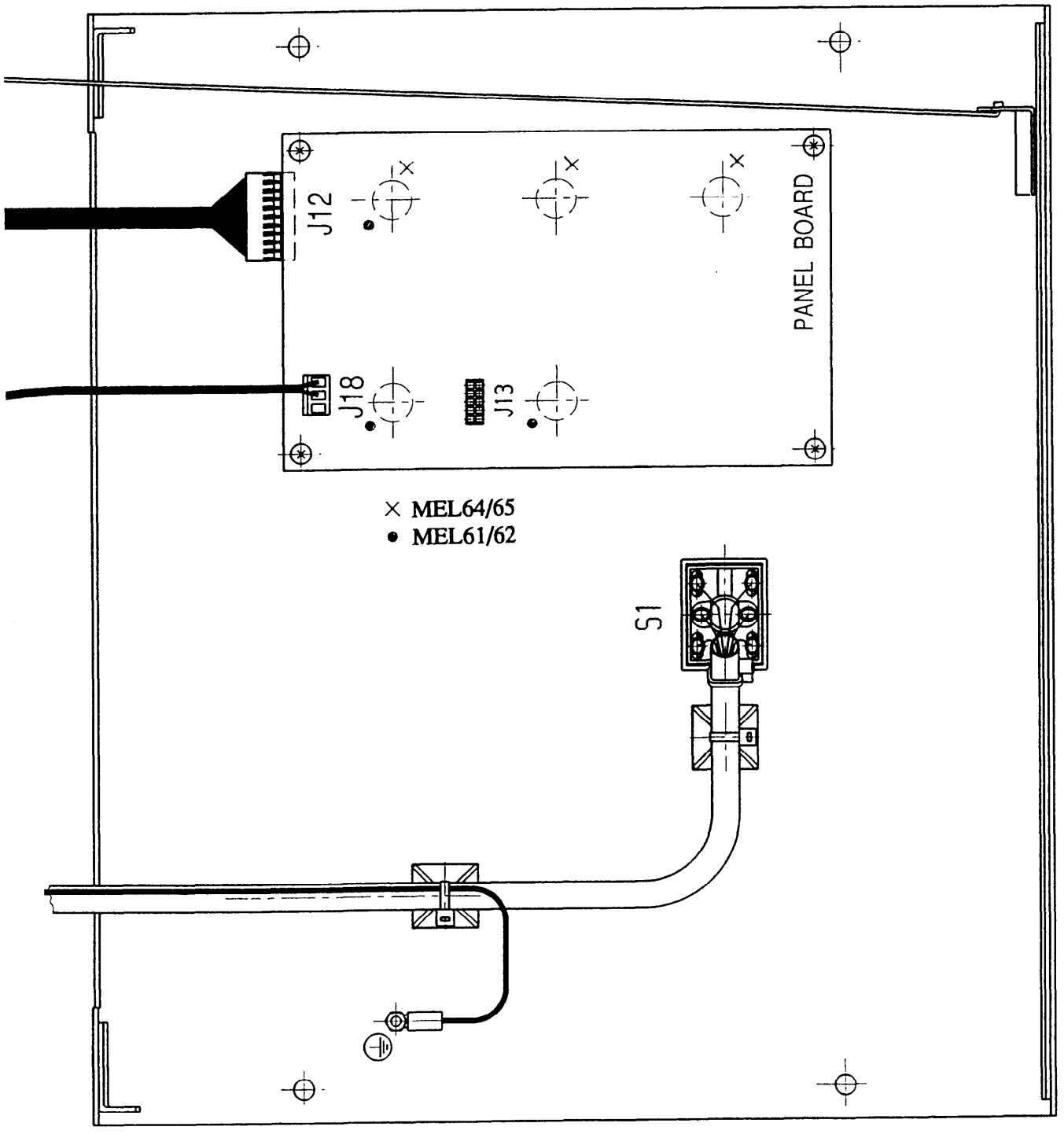


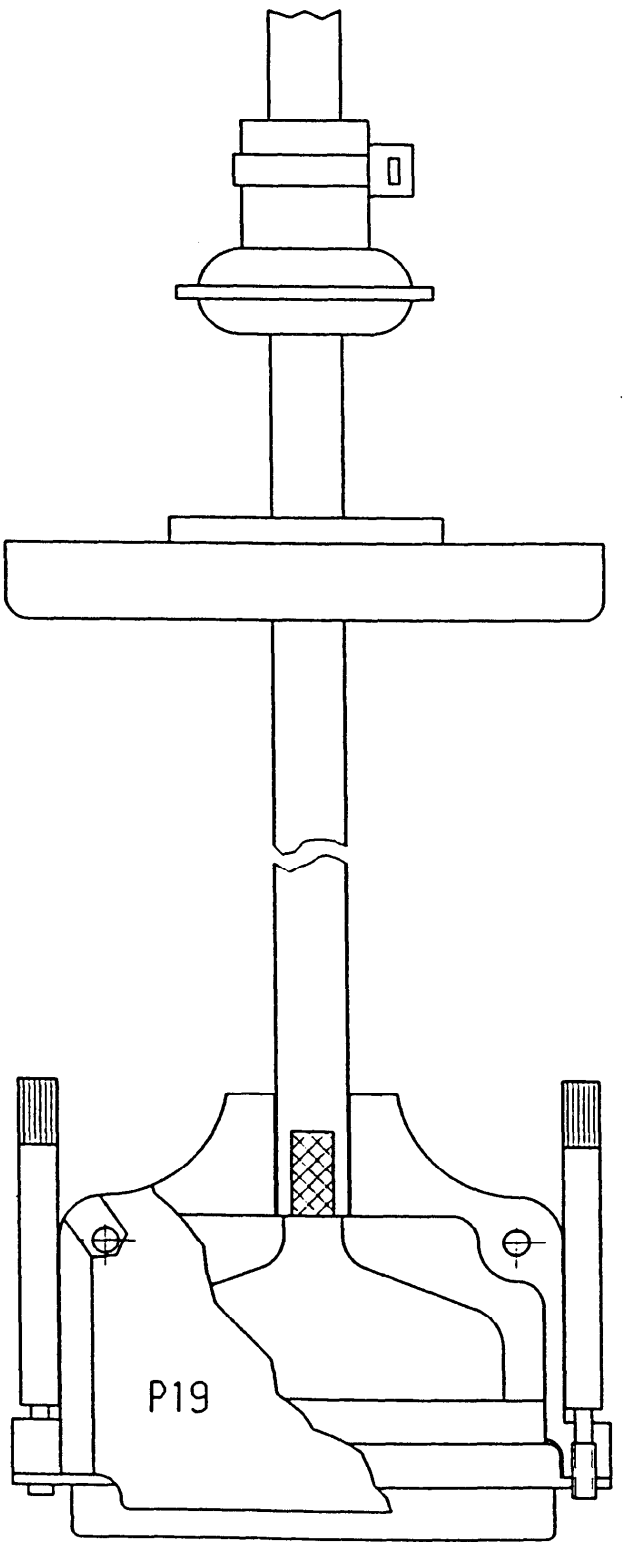
***Steuergerät MEL61/62 und MEL64/65*** - *Rückwand*
***Control unit MEL61/62 and MEL64/65*** - *Rear section*



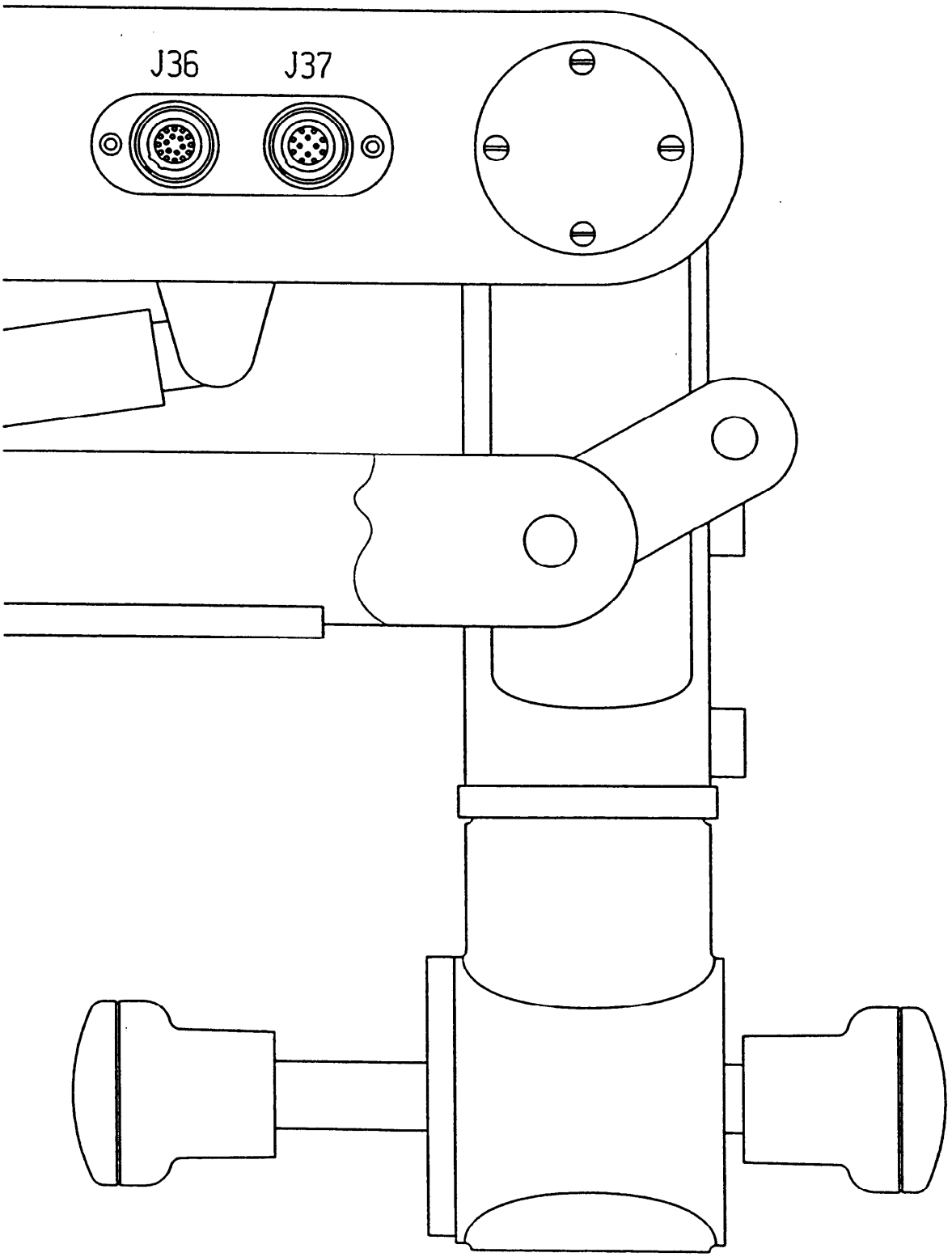
***Steuergerät MEL61/62 und MEL64/65 -*** *Front*
***Control unit MEL61/62 and MEL64/65*** *- Front section*



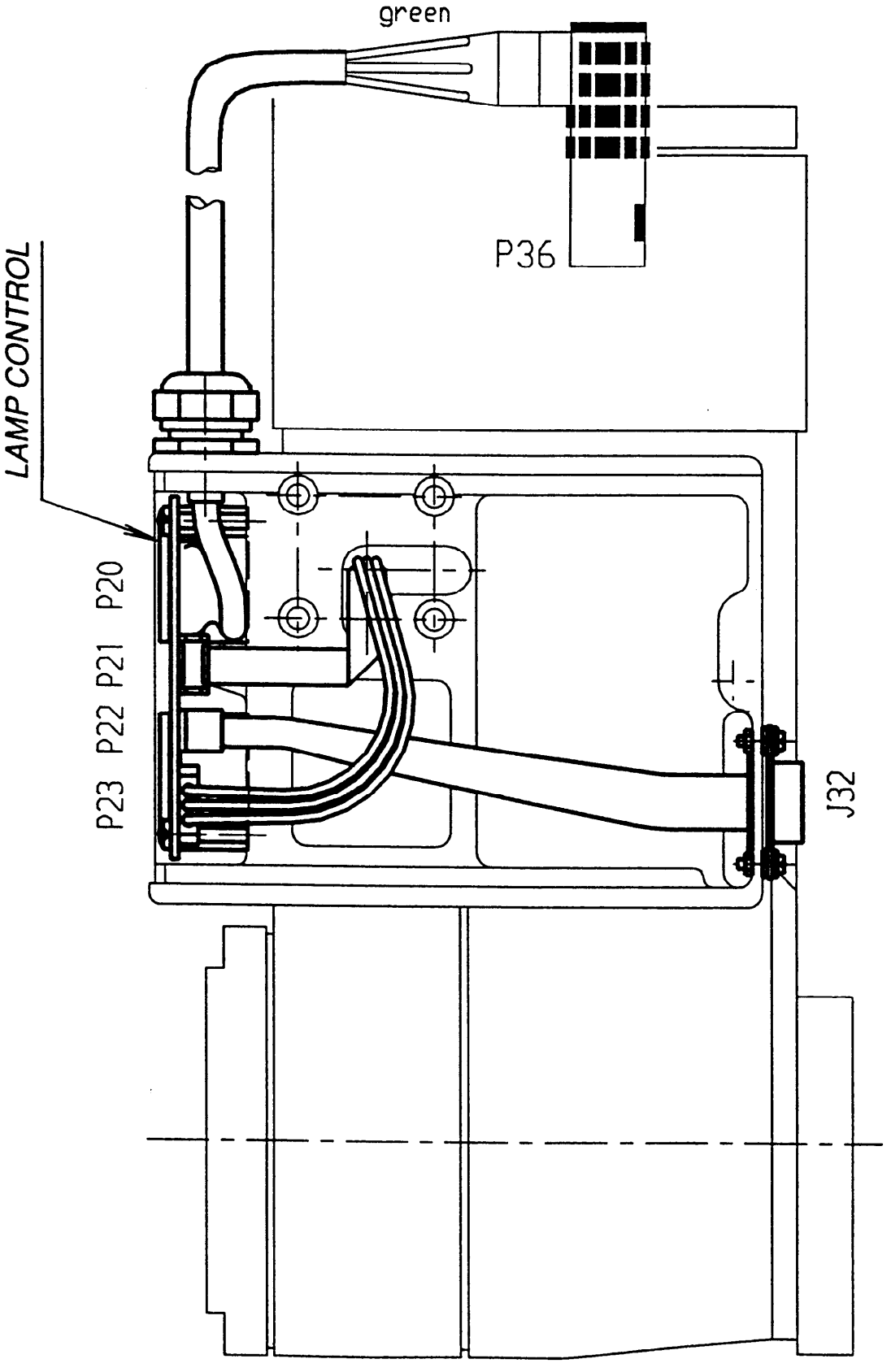
***Schwenkarmkabel** - Stecker zum Steuergerät*
***Swing arm cable** - Connector to control unit*



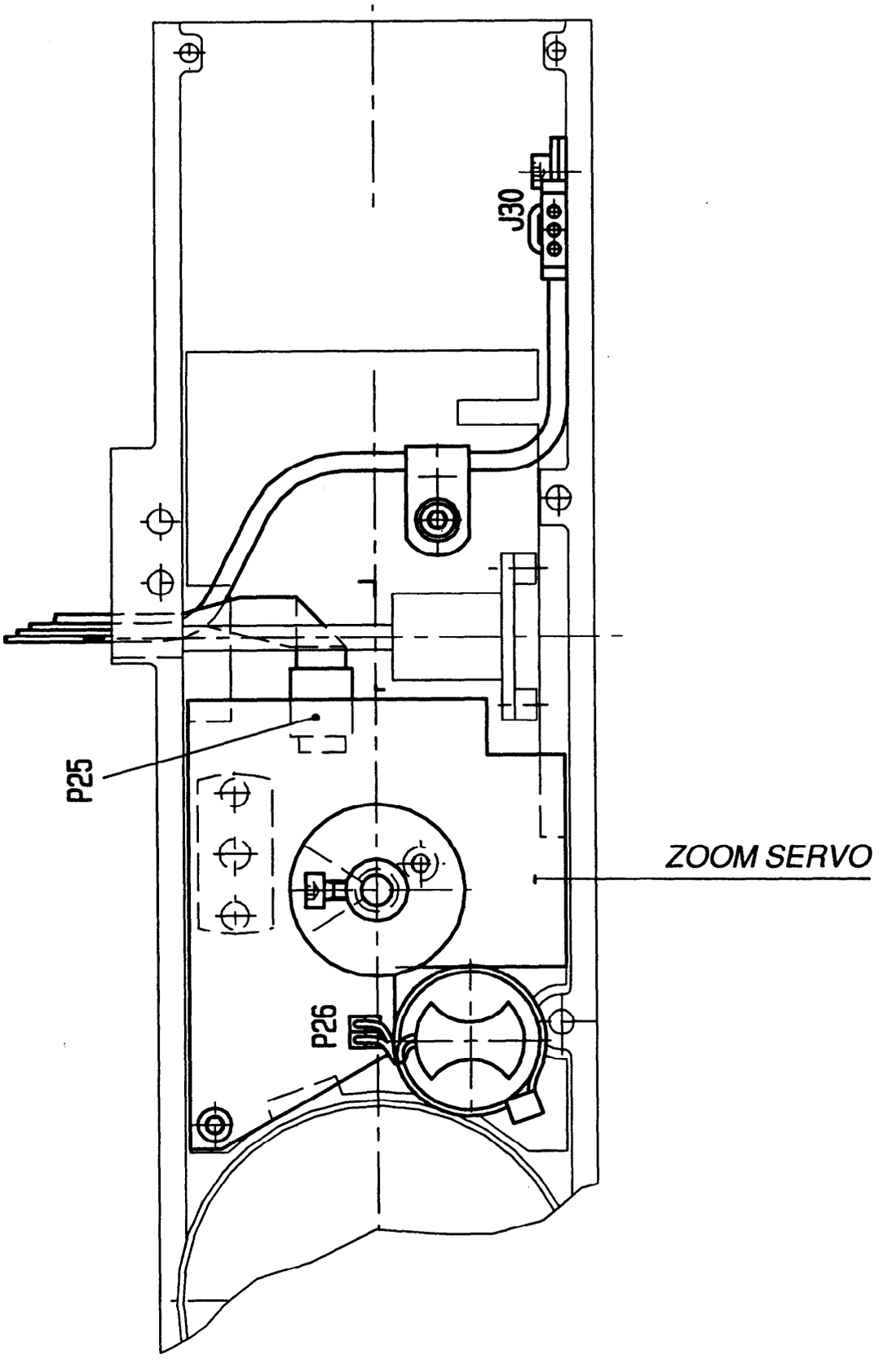
***Schwenkarmkabel*** *- Stecker zum Mikroskop M695*
***Swing arm cable*** *- Connector to microscope M695*



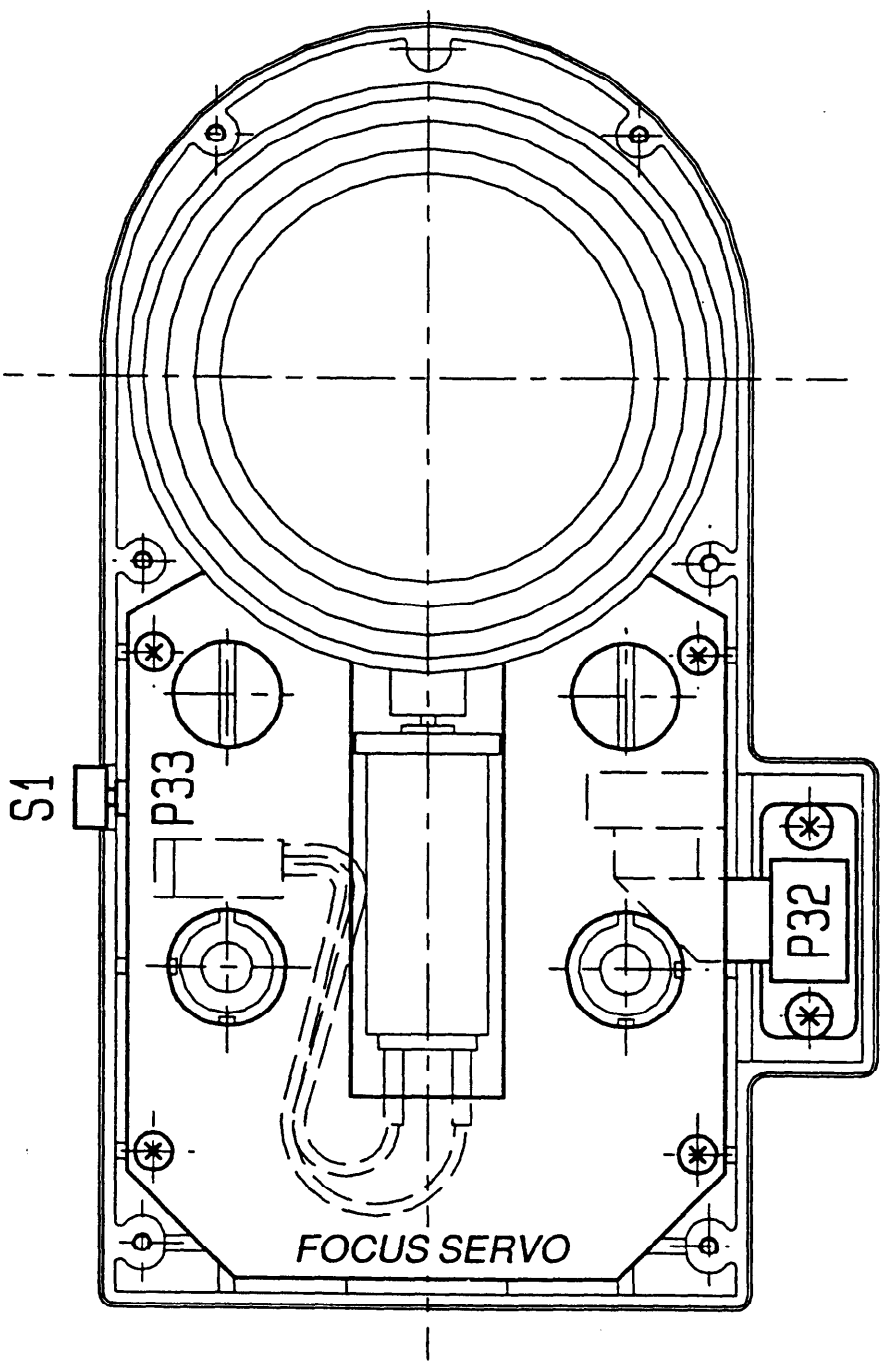
***Mikroskop M695 -*** *Ansicht auf U-Träger*
***Microscope M695 -*** *View to U-carrier*

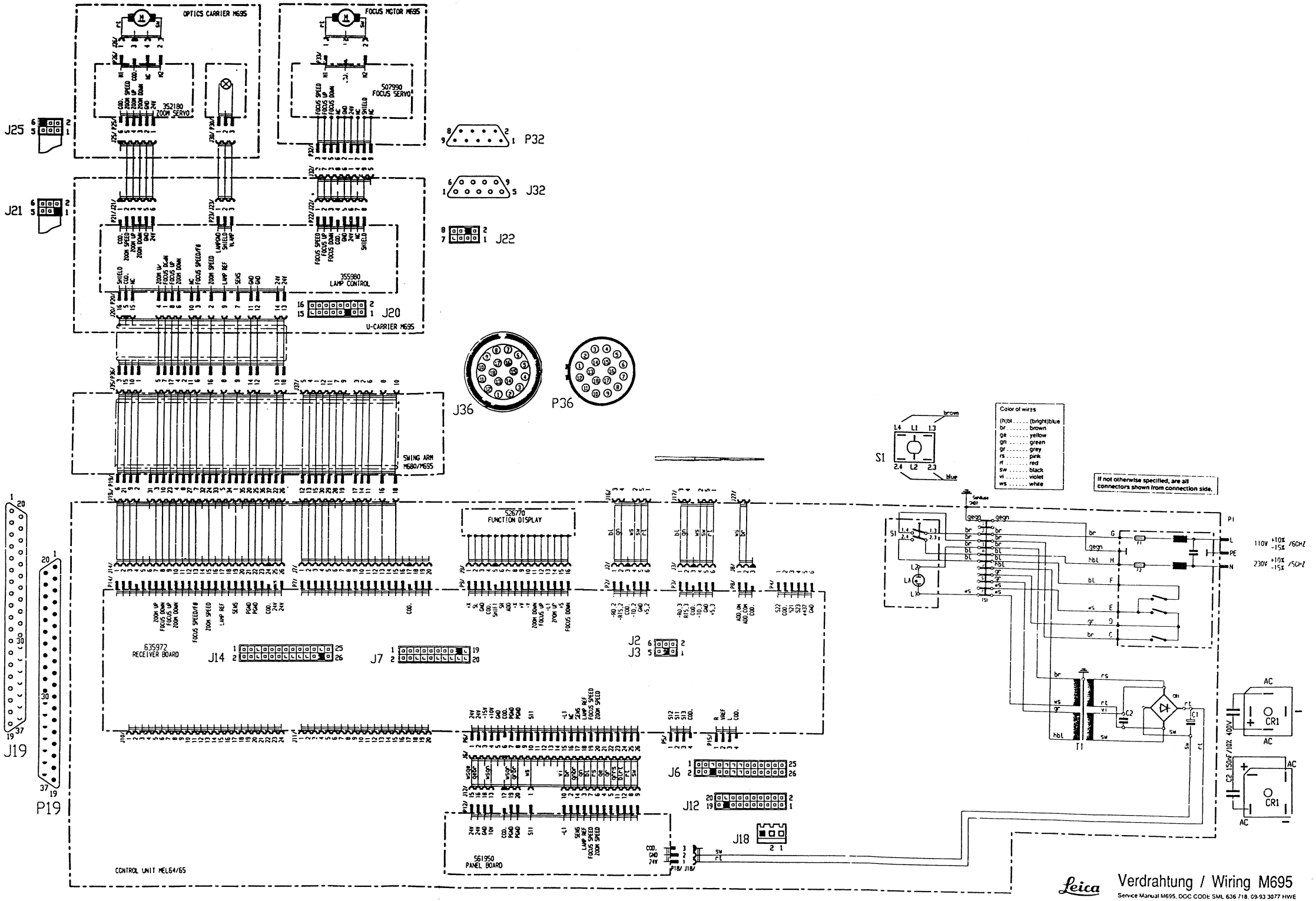


***Mikroskop M680*** *-Ansicht auf Zoom Servo*
***Microscope M680 -*** *View to zoom servo*



***Mikroskop M695 -*** *Ansicht auf motorische Fokussierung (MOB)*
***Microscope M695 -*** *View motorized focusing (MOB)*




OPTICS CARRIER M695
FOCUS MOTOR M695
352180
ZOOM SERVO
507990
FOCUS SERVO
355980
LAMP CONTROL
U-CARRIER M695
SWING ARM M580/M695
526770
FUNCTION DISPLAY
635972
RECEIVER BOARD
561950
PANEL BOARD
CONTROL UNIT MEL64/65
J25
J21
J20
P32
J32
J22
J36
P36
J19
P19
J14
J7
J2
J3
J6
J12
J18
S1
T1
P1
Color of wires
If not otherwise specified, are all connectors shown from connection side.
110V +10% -15% /60HZ
230V +10% -15% /50HZ
C2 150nF/10% 400V
Verdrahtung / Wiring M695
Service Manual M695, DOC CODE SML 636 718, 09-93 3077 HWE

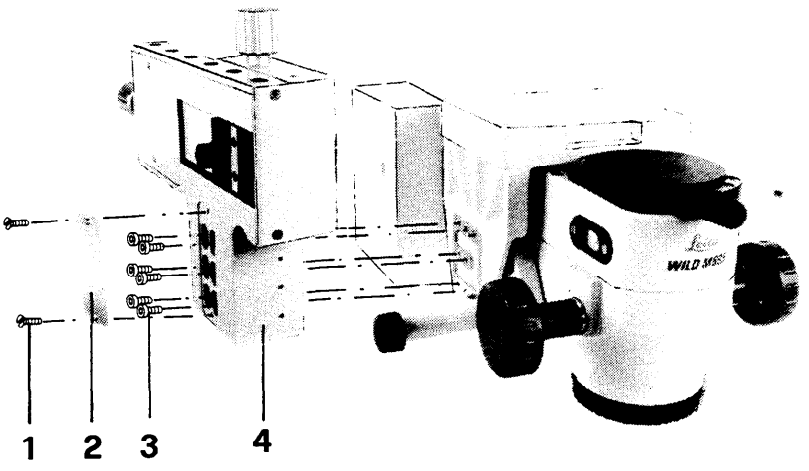
## Contents

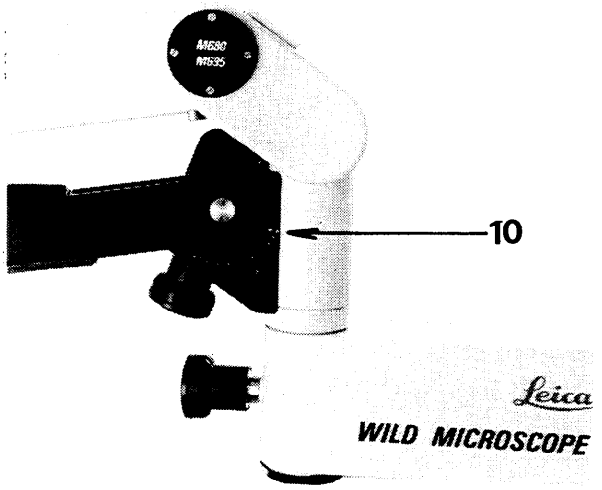
| | Page |
|---|---|
| Replace X-Y slide | 10-1 |
| Replace gas spring of swingarm | 10-2 |
| Replacing swingarm cable | 10-5 |

## *Replace X-Y slide*

Remove 2 screws (1) and cover (2).
Remove 6 hollow screws (3) and X-Y slide (4).

After each manipulation, inspect the functioning.

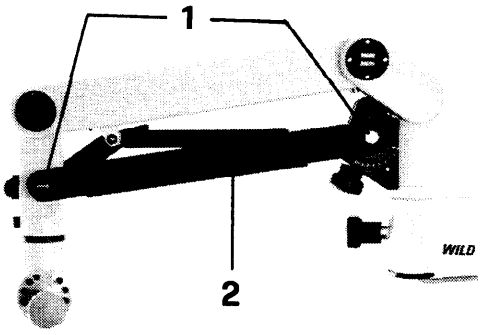


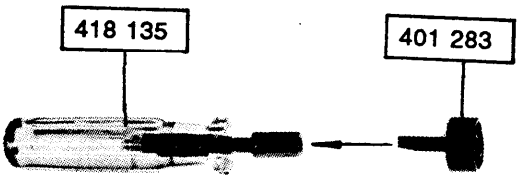


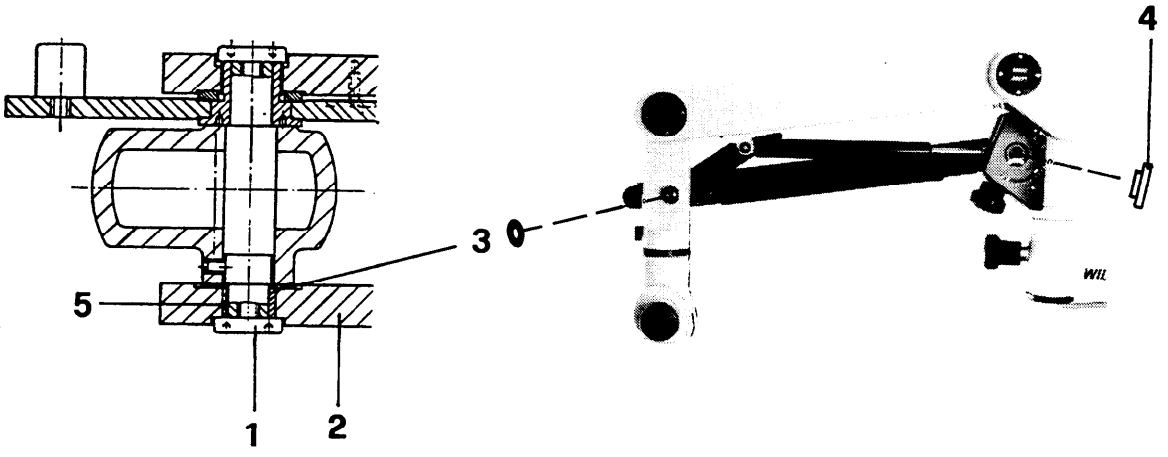

**Replace gas spring of swingarm MSV136/137**

Set counterbalance to "10". Remove 2 screws (1) and parallel bar (2).
Remove washer (3) and parking piece (4).

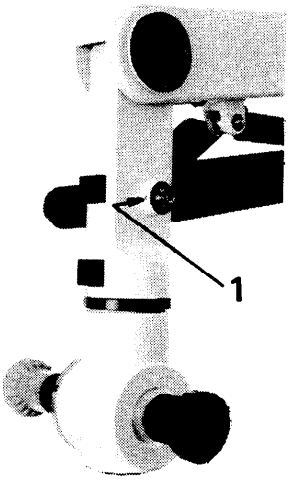
**Note:**
The hole-to-hole distance of the parallel bar can be set by turning the eccentric sleeve (5)

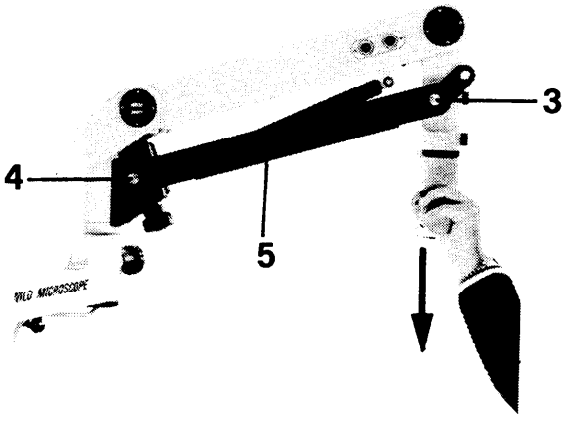


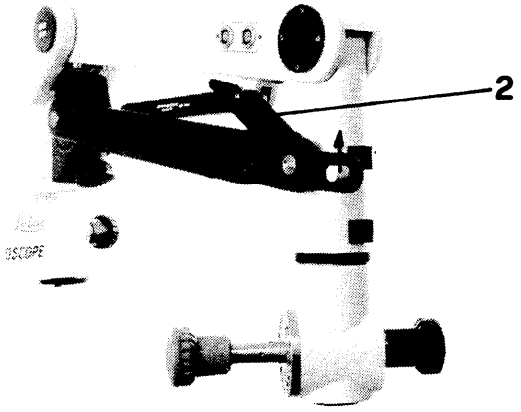



Release screw (1), disengage safety hook (2).
Pull swingarm down until spindle (3) and screw (4) are tension-free.
Remove spindle (3), screw (4) and parallel bar (5).

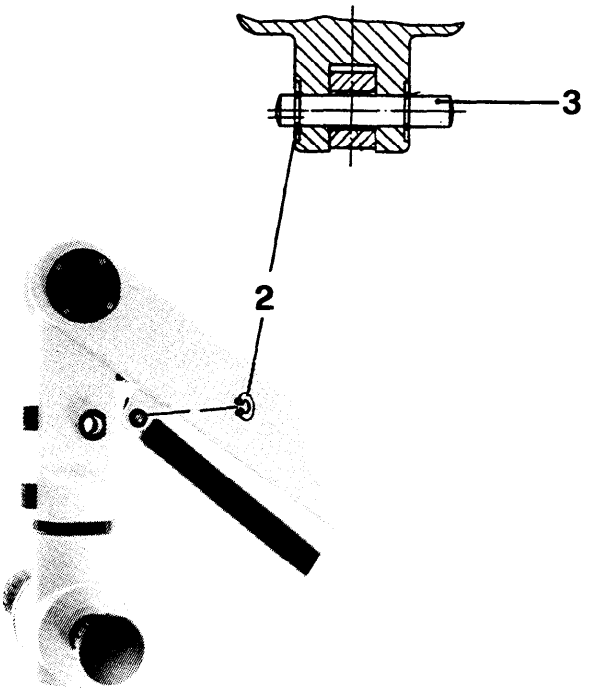


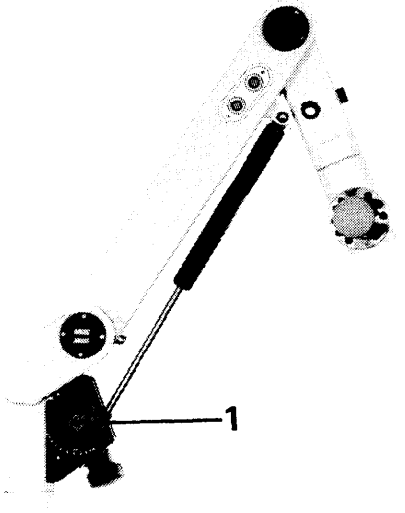
Remove spacer ring (1), safety ring (2) and pin (3).

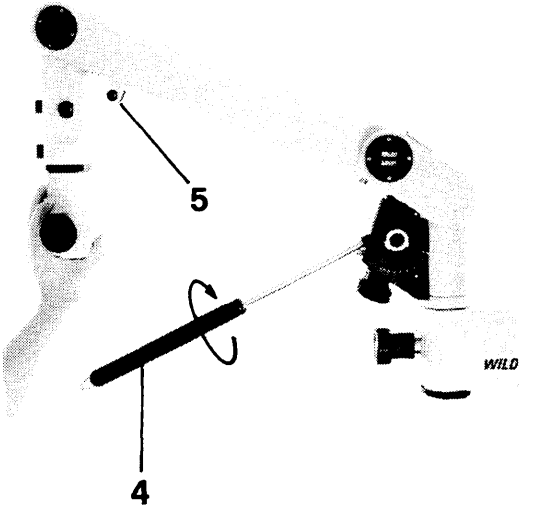
**Assembly:**
Fit pin (3) with longer end towards safety hook.

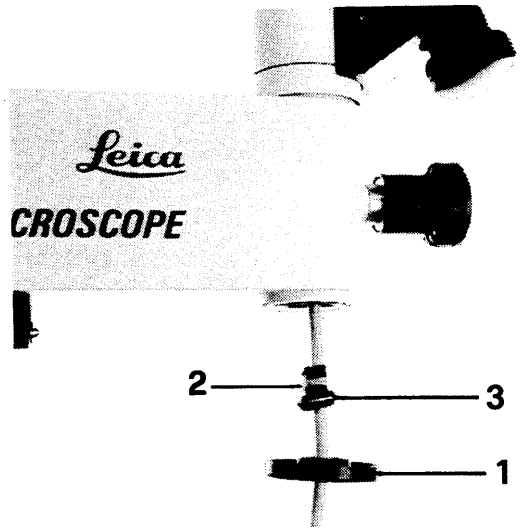



Remove gas spring (4) from mount (5) and unscrew it.

**Assembly:**
Screw gas spring fully in and then unscrew by up to ½ turn until swingarm bearing and gas-spring bearing coincide.






**Replacing swingarm cable**

Screw off cover ring (1) and cut off cable tie (2) from cable duct (3).
Remove 2 screws (4) and extract plug plate (5) complete with Lemo plug.

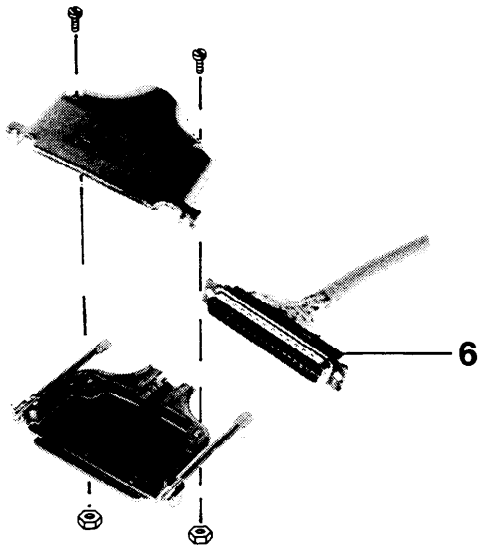
Open AMP plug and push contact pins out to the rear.

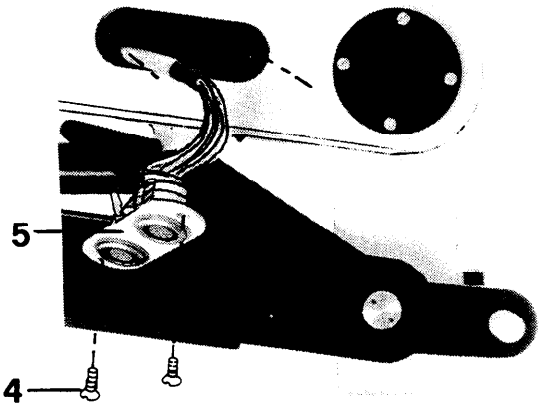
Pull cable out from swingarm.

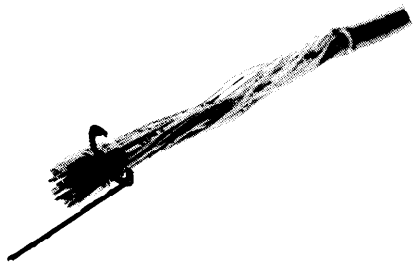
**Note:**
Tie a 1.5-metre long string to the cable so that it is easier to pull in.

**Assembly:**
Bundle together the contact pins of the new cable and bind them with adhesive tape.
Raise the swingarm to its highest position and pull in the cable.

Secure cable duct (3) with a cable tie, one metre away from the AMP plug.

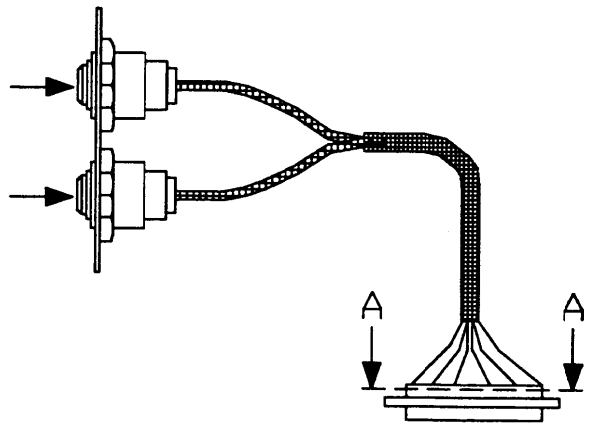


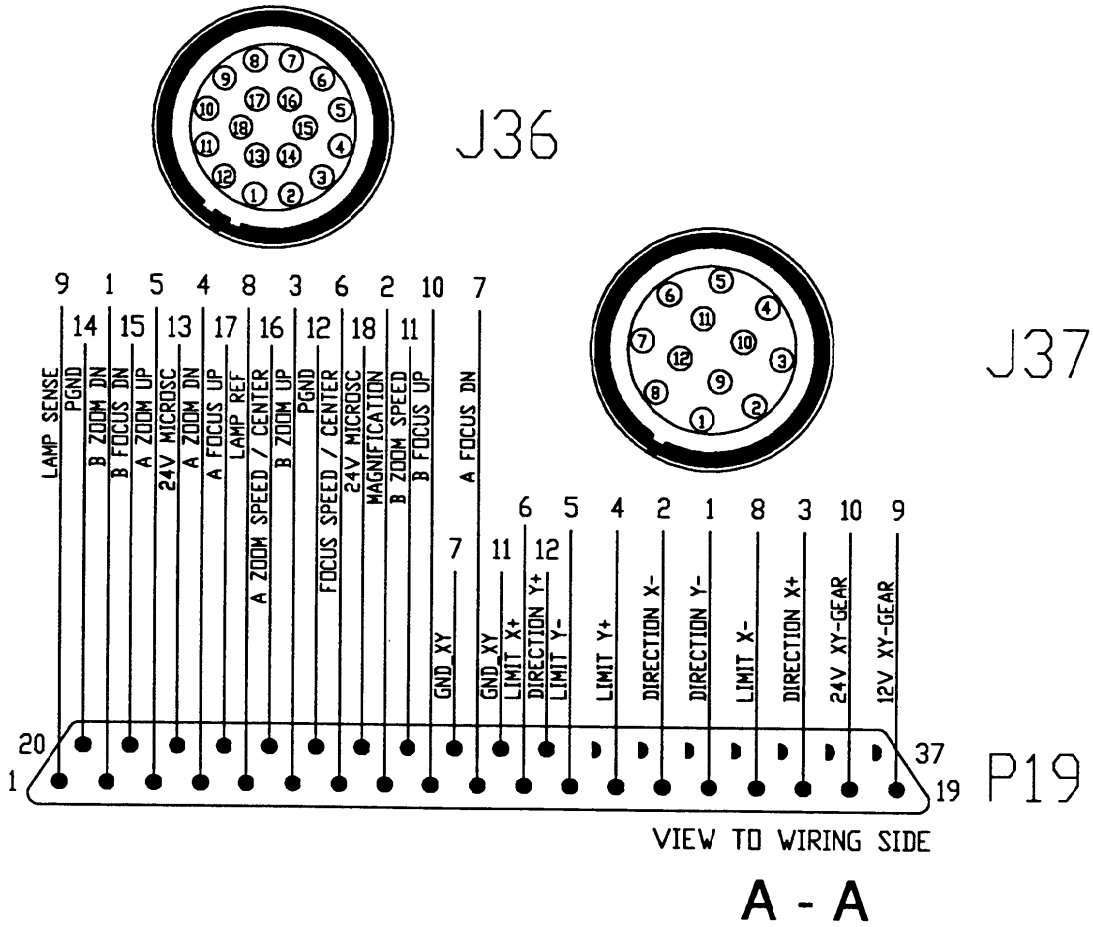



Inspect continuity of contacts in J36 and J37.

Plug wires into socket strip P19 in accordance with diagram.



## *Contents*

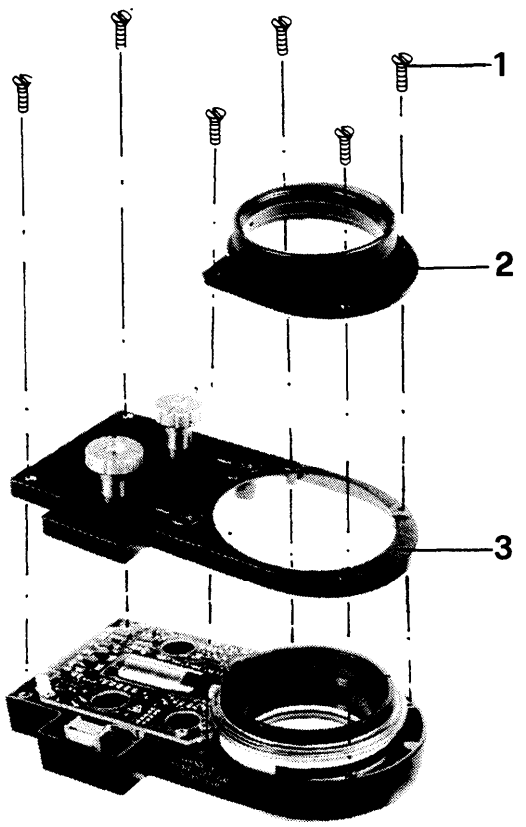
*Page*

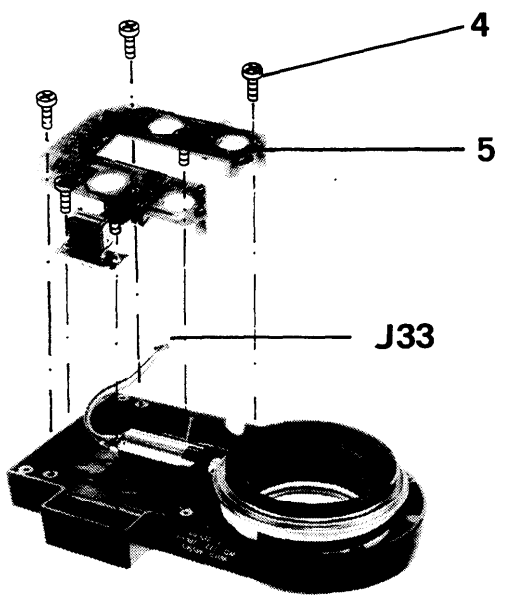
**Motorized focusing**
Focus servo board 11-1

**M695**
Replace lamp-control board 11-2

**Control unit**
Replacing panel board 11-3
Replacing receiver board 11-4
Replacing display board 11-4

# Motorized focusing



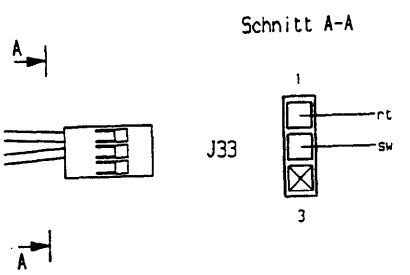




**Focus servo board for motorized focusing**

Remove 6 screws (1), adapter (2) and upper part of housing (3).

Remove 6 screws (4). Raise focus servo board (5). Pull out plug J33.

After each manipulation, inspect the functioning.

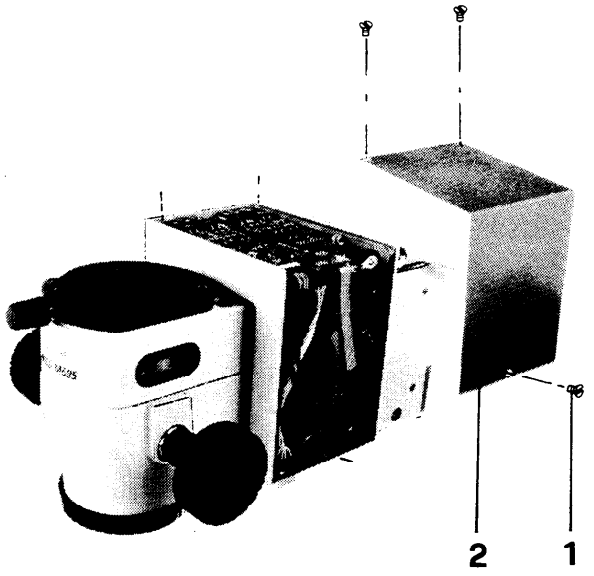


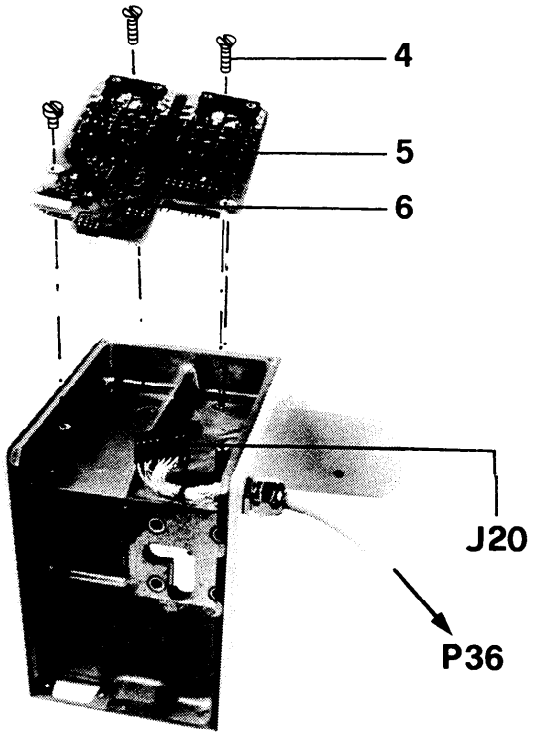
## *M695 optics carrier*

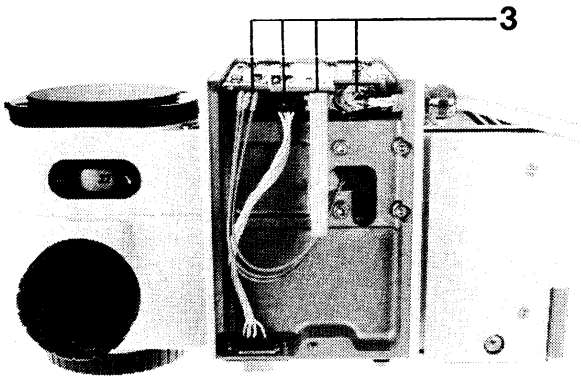
**Replace lamp-control board**

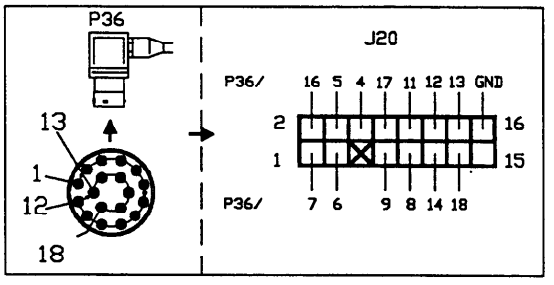
Remove 3 screws (1) and bracket (2).

Pull out 4 plugs (3), Remove 2 countersunk screws (4), 2 cheese-head screws (5) and the lamp-control board (6).

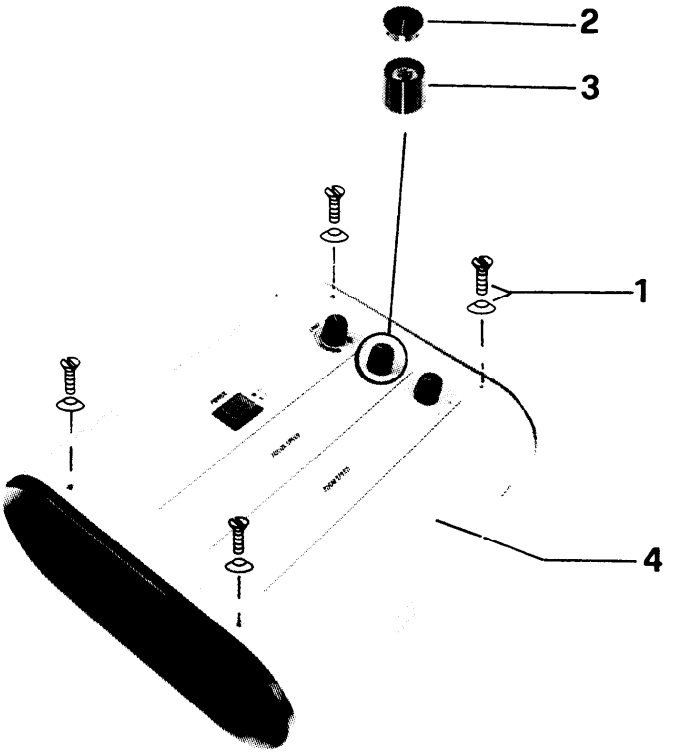


## Control unit MEL64/65

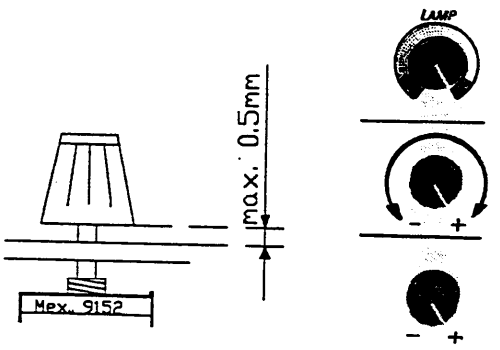


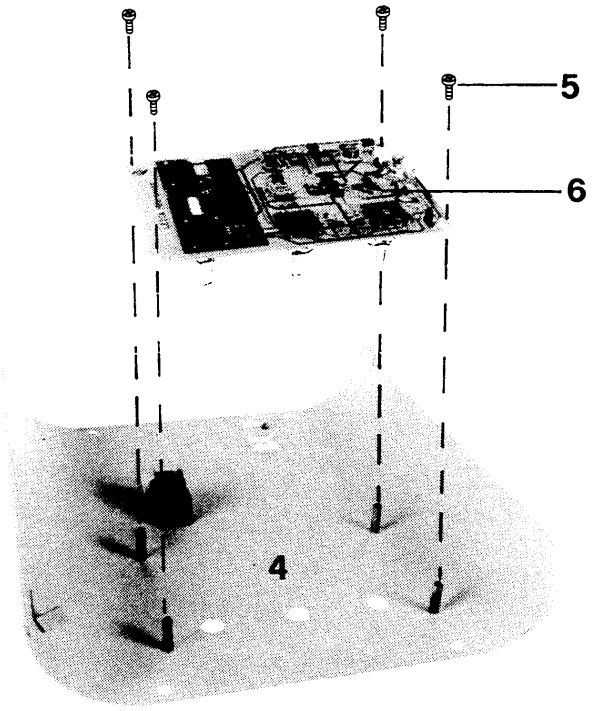

**Replacing panel board**

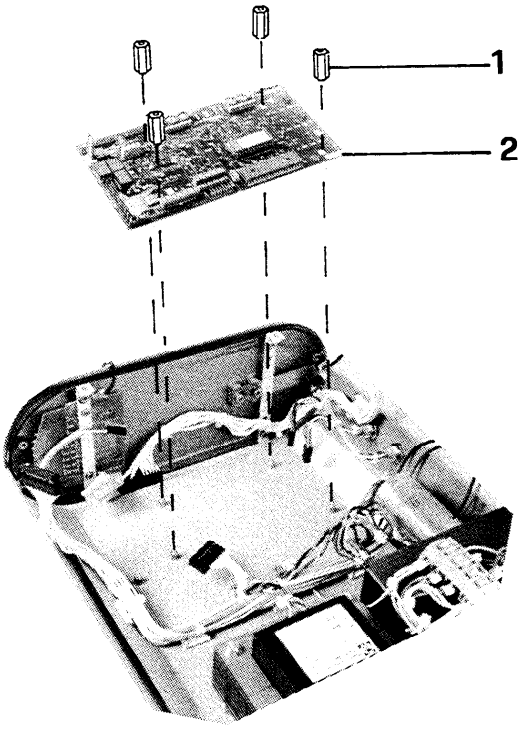
Remove 4 screws with washers (1). Remove knob cover (2) and knobs (3). Open front cover (4).

Pull out 2 plugs. Unscrew and remove 4 screws (5). Remove panel board (6).

**Assembly:**
The maximum permissible gap between knobs and front cover is 0.5mm.
Adjust the rotation range of the knobs.





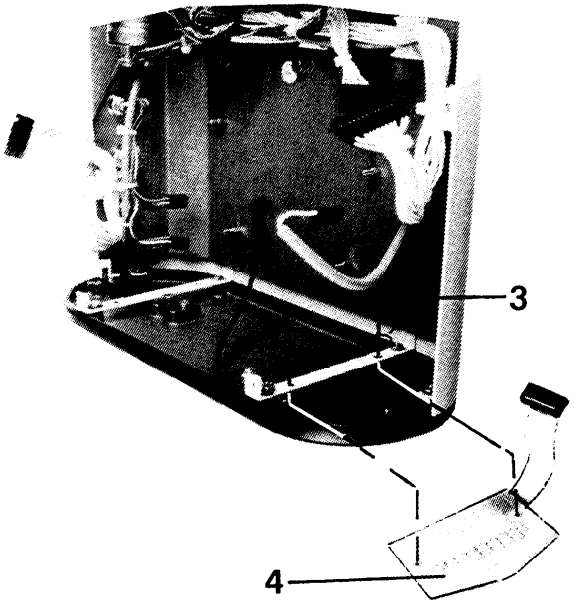

**Replacing receiver board**

Remove spacer nut (1). Pull plug out from receiver board (2). Remove receiver board.

**Replacing display board**

Remove 2 screws with washers (3), and take out function display (4)

**Assembly:**
Align LEDs with display window.



## *Contents*

| Section | Page |
|---|---|
| **1. Inspecting the hand- / footswitch functions and function display on the MEL64/65:** | **12-l** |
| **2. Lamp control:** | **12-4** |
| **3. ZOOM control:** | **12-4** |
| **4. FOCUS control:** | **12-5** |
| **5. Optics** | **12-6** |
| **6. Tiltable joint / swingarm** | **12-6** |
| **Test report** | **12-7** |

## *Test plan for M695 surgical microscope*

*Always pull out the power plug before opening the control unit!*

**Assemble the M695 surgical microscope in accordance with the user manual, but disconnect all cables.**

***Inspect the M695 system, using the test box (Test set M695/M680, stock no. 566 152)***

## *1. Inspecting the hand- / footswitch functions and function display on the MEL64/65:*

**1.1 Connect the hand- /footswitch (6 functions) and the power plug to the MEL 64/65.**

- The plugs must go in and out without difficulty.

**1.2 Activate the power switch of the MEL64/65.**

- The control unit switches on and the indicator lamp in the power switch shines.
- The 5V LED on the function display shines.
- The ML LED on the function display shines.

If the control unit does not switch on:
Inspect the power cable and the power connection
Inspect the fuse on the panel board inside the control unit
(see wiring plan in section 9 and power unit defect search procedure on page 4-3)

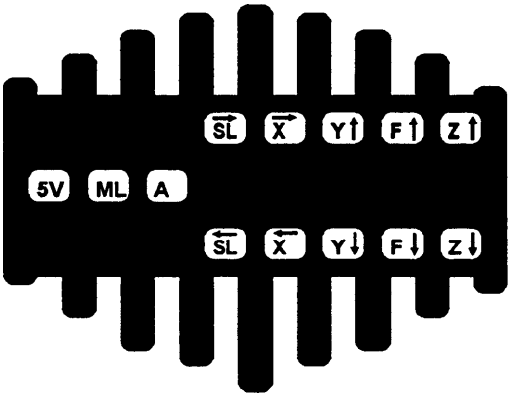
**(Power unit defect search procedure, page 4-3)**

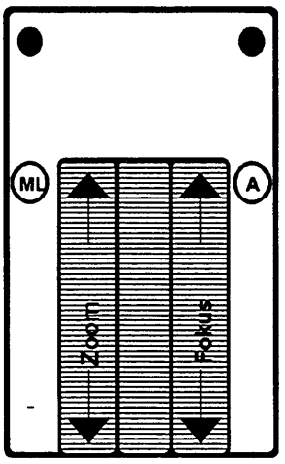
### 1.3 Activate the foot- or handswitch functions.

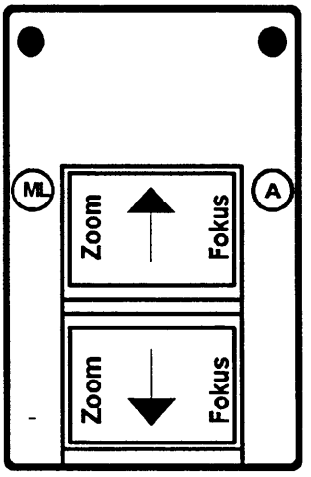
- The appropriate LED on the function display shines.
  (If a fault arises, exchange the foot- or handswitch and repeat the inspection procedure.
  If there is still a fault, then its source is to be found in the MEL64/65 control unit.)

**(Fault location in hand-/footswitch functions, page 4-4)**

ML on/off
Microscope lamp **M L**
A on/off
Additional illumination **A**
Focus up
Focus down **F**
Zoom up **Z**
Zoom down **Z**



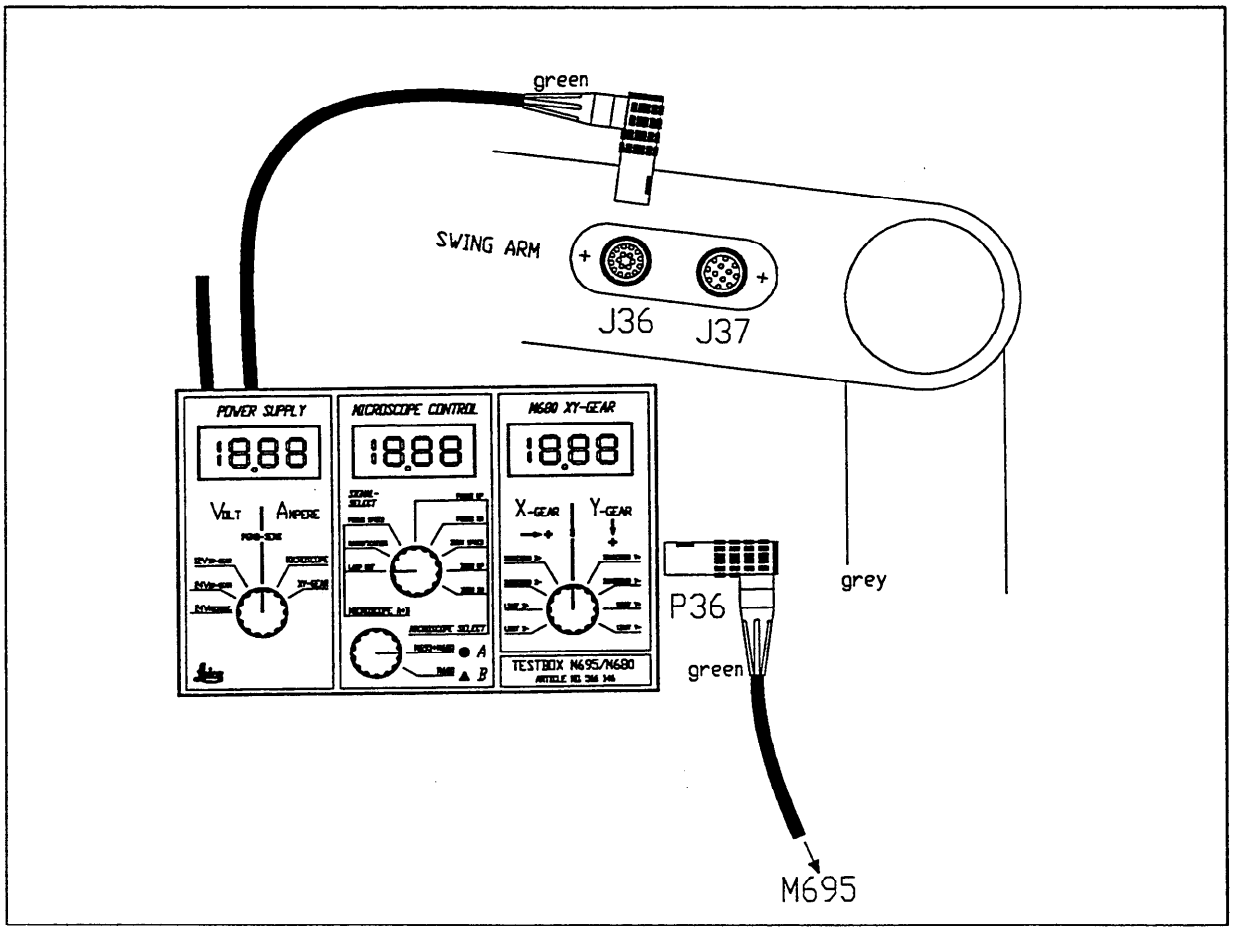




### 1.4 Connect cables of microscope and swingarm,

- The plugs must go in and out without difficulty.

**Preparation: Connect test box.**

- Separate plug connection J/P36 on swingarm.
- Hang test box on to swingarm. Connect plug P36 from test box to swingarm, and from M695 microscope to test box.
- Set test box switch ***"MICROSCOPE SELECT"*** to **A.**



## 2. Lamp control:

**2.1 Turn LAMP potentiometer on control unit from min. to max.**

- Reading on test box: LAMP REF. min./max. 0.3.....5v.
  The brightness of the microscope lamp is continuously adjustable.

**2.2 Activate the quick-change lamp mount.**

- The spare bulb is moved into the beam path, and lights up.
- The orange indicator springs out.
  (Push the orange indicator back into the rear wall)

**(Fault location in lamp control: page 4-7)**

**Important: Before proceeding further with the test, reset the lamp to its minimum brightness.**

## 3. ZOOM control:

**3.1 Turn the ZOOM SPEED potentiometer from min. to max. and from max. to min.**

- Reading on test **box:** ZOOM SPEED min./max 1.84...2.34Vl5V ±5%
  The zoom speed is continuously adjustable.

**3.2 Use foot-/handswitch to activate ZOOM UP.**

- Reading on test box: ZOOM UP Low/High <0.2V/>4.75V

**3.3 Use foot-/handswitch to activate ZOOM DN.**

- Reading on test box: ZOOM DN Low/High <0.2V/>4.75V

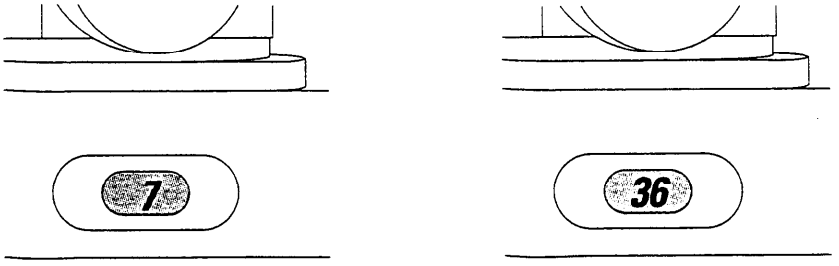
**(Fault location in ZOOM control: page 4-8)**

**3.4 Mechanical zoom movement.**

- Zoom moves uniformly in both directions.

**3.5 Inspect zoom range.**

- Travel to zoom end positions 7 and 36 using max. SPEED. Zoom should not touch mechanical stop. Relevant magnification is seen centred in window.




## 4. FOCUS control:

**4.1 Turn FOCUS SPEED potentiometer from min. to max. and from max. to min.**

- Reading on test box: FOCUS SPEED min./max. 1.25...1.7V/5V ±5%
  The focus speed is continuously adjustable.

4.2 **Use foot-/handswitch to FOCUS UP.**

- Reading on test box: FOCUS UP Low/High <0.2V/>4.75V

4.3 **Use foot-/handswitch to FOCUS DN.**

- Reading on test box: FOCUS DN **Low/High <0.2V/>4.75V**

**(Fault location in FOCUS control: page 4-9)**

4.4 **Mechanical focus movement**

- Focus moves uniformly in both directions.

4.5 **Activate yellow knob on motorized focusing: FOCUS reset**

- Focus automatically returns to basic position.
  (Use FOCUS UP and DN to travel away from basic position, and repeat test)

# 5. Optics

## 5.1 Cleanliness of optical components

- All surfaces of optical components in the observation and illumination beam paths must be clean,

## 5.2 Zoom

- Focus on the object and operate ZOOM UP and ZOOM DOWN at their minimum speeds.
  The image sharpness should remain constant over the entire zoom range.

l The image should not jump suddenly when ZOOM UP and ZOOM DOWN are being operated.

# 6. Tiltable joint / swingarm

## 6.1 Rotation

- The tiltable joint must be easily and smoothly tumable after the brake has been released.

## 6.2 Brakes

- As the braking knob is applied, the movement becomes steadily less free and finally the joint locks completely. When the brake knob is turned the other way, the movement steadily becomes easier.

## 6.3 Clip-on handles

- The sterilizable clip-on handles must be convenient to put on and take off again. They must click in and out perfectly.

## 6.4 Gas spring

- The vertical adjustment must be smoothly adjustable from one end to the other.

- At maximum loading, and with the weight compensation at 10, the swingarm must not drift downwards.

## 6.5 Weight compensation

- The adjusting spindle must be adjustable from 0 to 10.

## 6.6 Safety hook

- The safety hook must engage faultlessly. When it is moved sideways, the ratchet bolt must remain in position.

# *Test report for M695 surgical microscope*

Customer: _____

Tested by: _____

Date: _____

| *Stock no.* | *Description* | *Serial no.* |
|---|---|---|
| 445 560 | Optics carrier M695 | ..... |
| 445 561 | Microscope carrier 45° | ..... |
| 445 562 | Microscope carrier 45°/70° | ..... |
| 445 494 | Swingarm MSV136 for floor stand | ..... |
| 445 740 | Swingarm MSV167 for ceiling mount | ..... |
| 445 551 | Control unit MEL64 for floor stand | ..... |
| 445 552 | Control unit MEL65 for ceiling mount | ..... |
| 445 365 | Objective, mot. foe., f=250mm | ..... |
| 445 563 | Objective, mot. foe., f=325mm | ..... |
| 445 564 | Objective, mot. foe., f=275mm | ..... |
| ..... | Footswitch (6 functions) | ..... |
| 445 203 | Handswitch (12 functionsn) | ..... |
| ..... | Binocular tube MTU . . . . . | ..... |

**Other accessories:**

| | | |
|---|---|---|
| ..... | ..... | ..... |
| ..... | ..... | ..... |
| ..... | ..... | ..... |
| ..... | ..... | ..... |

# Test report for M695

| | | Tested | | |
|---|---|---|---|---|
| *1.* | ***Test hand-or footswitch functions and function display on MEL64/65:*** | | | |
| 1.1 | Connections, hand-/footswitch, power plug | | | |
| 1.2 | Power switch MEL64/65 | | | |
| | LED 5V | | | |
| | LED ML | | | |
| 1.3 | Foot-/handswitch functions | | | |
| | **ML** on/off / | | | |
| | **A** on/off / | | | |
| | **F↑** / Focus up | | | |
| | **F↓** / Focus down | | | |
| | **Z↑** / Zoom up | | | |
| | **Z↓** / Zoom down | | | |
| 1.4 | Connections, microscope and swingarm cable | | | |
| *2.* | ***Lamp control*** | | | |
| 2.1 | LAMP potentiometer function min./max. | | | |
| | LAMP REF. | | min. .....V | max. .....V |
| 2.2 | Quick-change lamp mount | | | |
| | Spare bulb | | | |
| | Orange indicator | | | |
| *3.* | ***ZOOM control*** | | | |
| 3.1 | ZOOM potentiometer function min./max. | | | |
| | ZOOM SPEED | | min. .....V | max. .....V |
| 3.2 | ZOOM UP | | Low ..... V | High . .....V |
| 3.3 | ZOOM DN | | Low ..... V | High . .....V |
| 3.4 | Mechanical running of zoom | | | |
| 3.5 | Zoom range (7x to 36x) | | | |
| *4.* | ***FOCUS control*** | | | |
| 4.1 | FOCUS potentiometer function min./max. | | | |
| | FOCUS SPEED | | min. .....V | max. .....V |
| 4.2 | FOCUS UP | | Low ..... V | High . .....V |
| 4.3 | FOCUS DN | | Low ..... V | High . .....V |
| 4.4 | Mechanical running of focus | | | |
| 4.5 | Basic focus position | | | |
| *5.* | ***Optical components*** | | | |
| 5.1 | Cleanliness of optical components | | | |
| 5.2 | Image sharpness / zoom range | | | |
| *6.* | ***Tiltable joint/swingarm*** | | | |
| 6.1 | Revolution of joint | | | |
| 6.2 | Brakes | | | |
| 6.3 | Clip-on handles | | | |
| 6.4 | Gas spring | | | |
| 6.5 | Weight compensation | | | |
| 6.6 | Safety hook | | | |

# M695 service courses

**Content:**

Assembling the microscope on the floor stand
Exchanging modules and boards
Replacing the gas spring in the swingar
Using the test box to locate faults

**Goals:**

After the course, the participant should be able to

- install the instrument ready for use
- use the test box to locate faults
- exchange modules and boards in accordance with the instructions
- carry out a comprehensive inspection of the functions

**Location:**

Leica AG, Heerbrugg, Service LSG/MSM training department

In agencies, provided that the service technician (instructor) has alredy attended an M695 course at Leica AG in Heerbrugg

**Duration:**

2 days

**Cost:**

In accordance with present guidelines, described in the Service Training Program (excluding travel and accomodation).

**Technical Requirements:**

Basic knowledge of mechanical engineering and of measuring technique

**Number of participants:**

Individuell

**Remarks:**

Send application to agency

# Test set M695/M680 - stock no. 566 152

**Contents of test set**

- Test box, stockno. 566 146
- Service cable M695/M680, stock no. 566 148
- Service handswitch, stock no. 566 147

**Enables defective assemblies to be identified**

- Foot- or handswitch
- Swingann
- Control unit MEL61/62 and MEL64/65
- X- or Y-gear MSV138 (M680 only)
- M695/M680 microscope

**Procedure for fault location**
**See section 4**

1. Introduce the test box between the swingarm and the microscope - Plug connections JP36 and JP37.
2. Inspect the voltages and currents of the POWER SUPPLY as described in Section 4.

*Cause in footswitch?*

3. Substitute service handswitch for footswitch, observe signal voltages, and also monitor LEDs on control unit.
4. Observe the signal voltages of the defective function (MICROSCOPE CONTROL or XY-gear) - as described in Section 4.

*Cause in microscope of in XY-gear?*

5. Separate the microscope or the XY-gear, as appropriate, from the test box, and observe the signal voltages which flow from the control unit through the swingann.

*Cause in control unit or swingarm?*

6. Use service cable to bridge swingarm, and observe signal voltages from control unit.

# Functions of test box

*All control voltages . . .*

All supply- and control voltages between the control unit and the microscope with XY-gear can be measured.

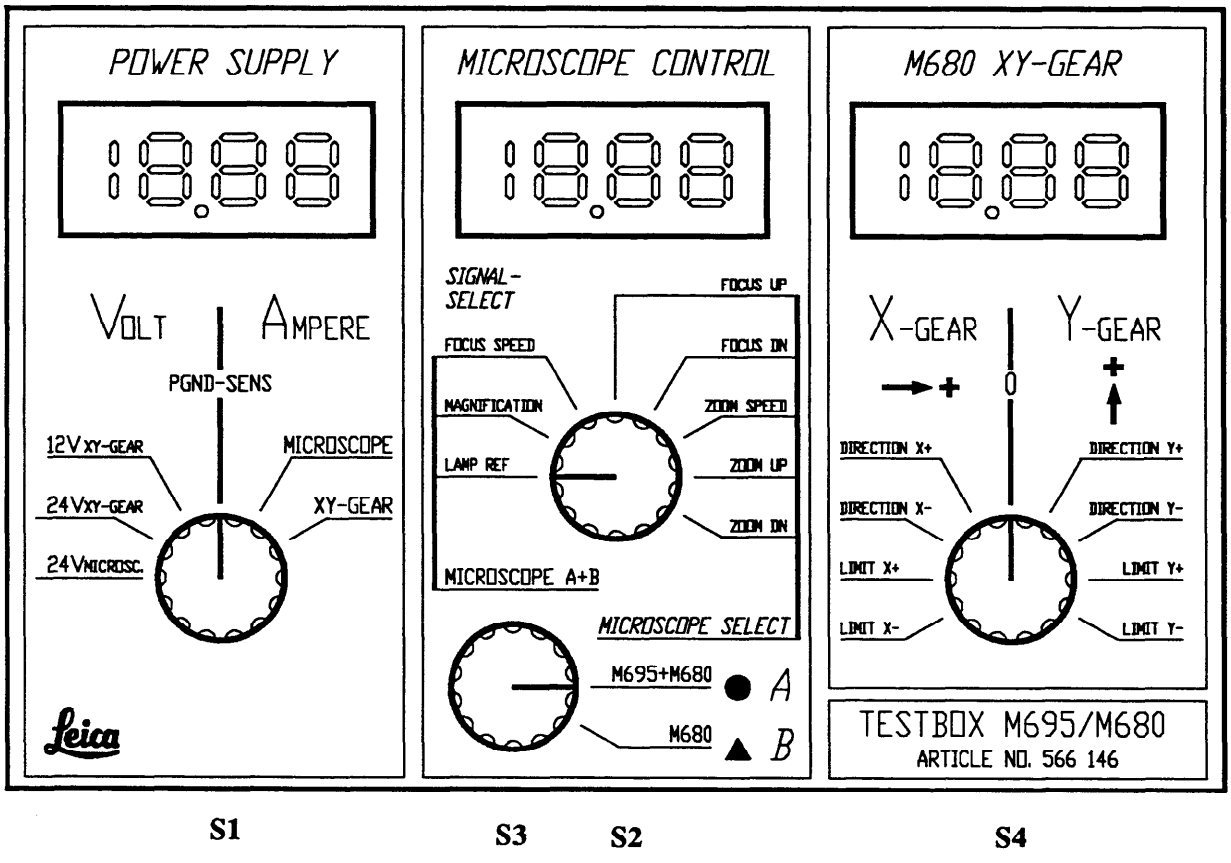
*. . . to the microscope . . .*

Control voltages to the microscope are measured relative to XY_GND, such to the XY-gear relative to GND_XY.

*. . . measure at low light level*

Unless otherwise indicated, set the lamp to minimum brightness. The voltages indicated in Section 4 are only valid for this condition.

*Voltage levels are falsfied by the voltage drop between the control unit and the microscope. Because of the current taken by the lamp, this voltage drop to PGND (measuring ground) can be as much as 0.9V. The control voltages of focus and zoom are measured against PGND and are therefore influenced.*



***The test box: three multimeters***

One digital voltmeter is assigned to each of the functions **POWER SUPPLY,** MICROSCOPE CONTROL and XY-GEAR. The signals reach the measuring instrument through a rotary switch.

***Digital voltmeters***

**Range of measurement:** 1.999V - with overflow display (OL)

**Measurement precision:** 1% +- 1 digit, 2 measurements/second

**Auxiliary voltage:** 7 . . . 15VDC

***Supply for digital voltmeter***
*Circuit diagram on page 18-5*

The power is derived from the 24V supply of the XY-gear (at control unit MEL61/62 only). Three galvanically-separating DC converters each reduce the voltage to approx. 12V each.

**Rotary switch S1:** Displaces the decimal point on the display by one digit to the right for the 24V - measuring ranges.

***POWER SUPPLY***
*Diagram on page 18-6*

**Rotary switch S1:** Level 1 ... Selects current- and voltage ranges.

**Voltage distributor:** 1/10 for 12V range
1/100 for 24V ranges

**Current measurement range:** Voltage drop across 0.1 ohm resistor.

**Measuring ground:** PGND - $24V_{MICROSCOPE}$
**SENS - PGND**
GND-XY - 12V / $24V_{XY\text{-}GEAR}$

***MICROSCOPE CONTROL***
*Diagram on page 18-7*

**Rotary switch S3:** Selects those signals which are assignable either to microscope A or to microscope B.

**Rotary switch** *S2:* Selects the control signals to and from the microscope.

**Voltage distributor:** 1/10

**Measuring ground:** **SENS**

***XY-GEAR***
***(at M680 only)***
*Diagram on page 18-8*

**Rotary switch S4:** Selects the signals from and to XY-GEAR.

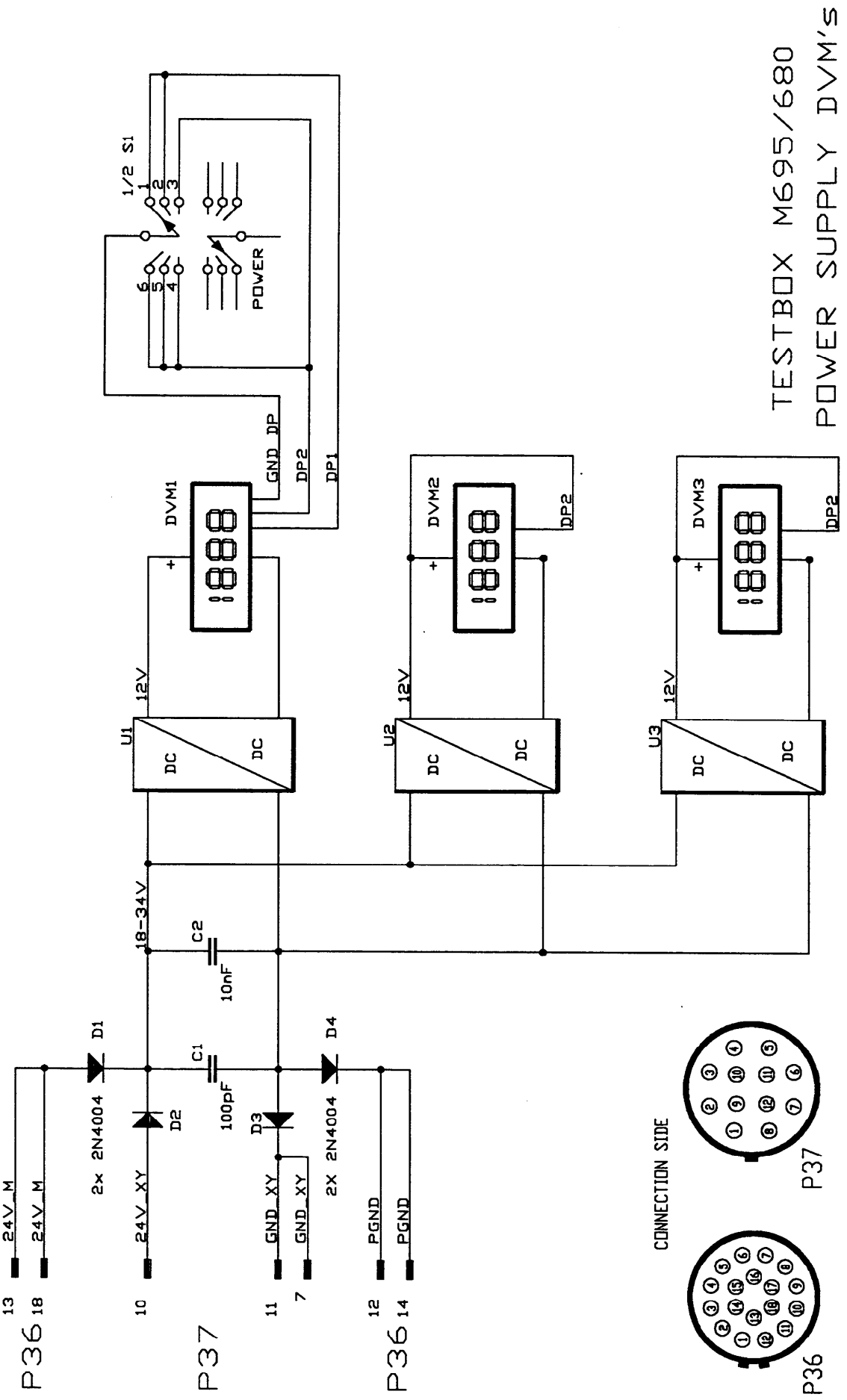
**Voltage distributor:** 1/10

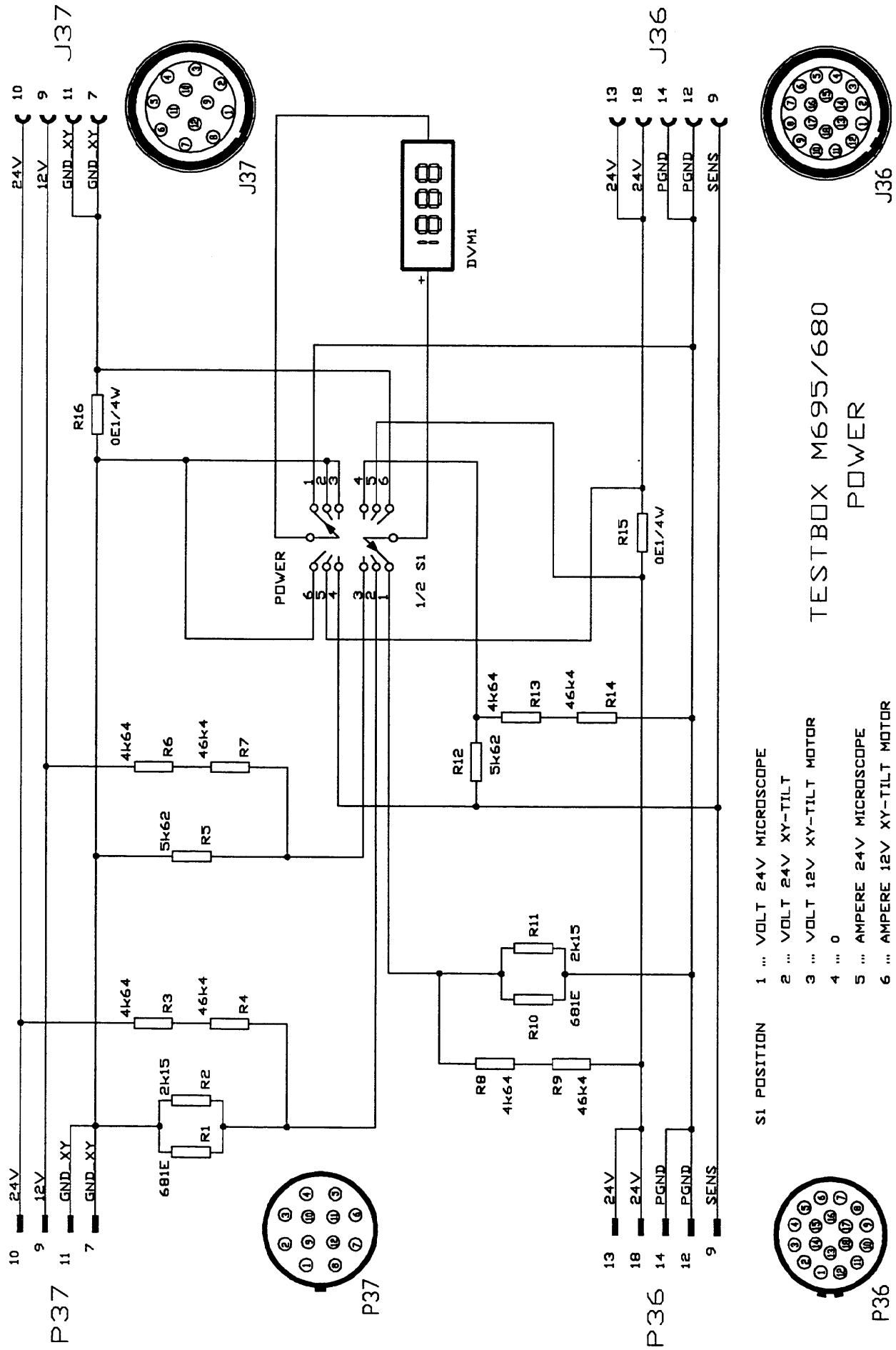
**Measuring ground:** GND_XY

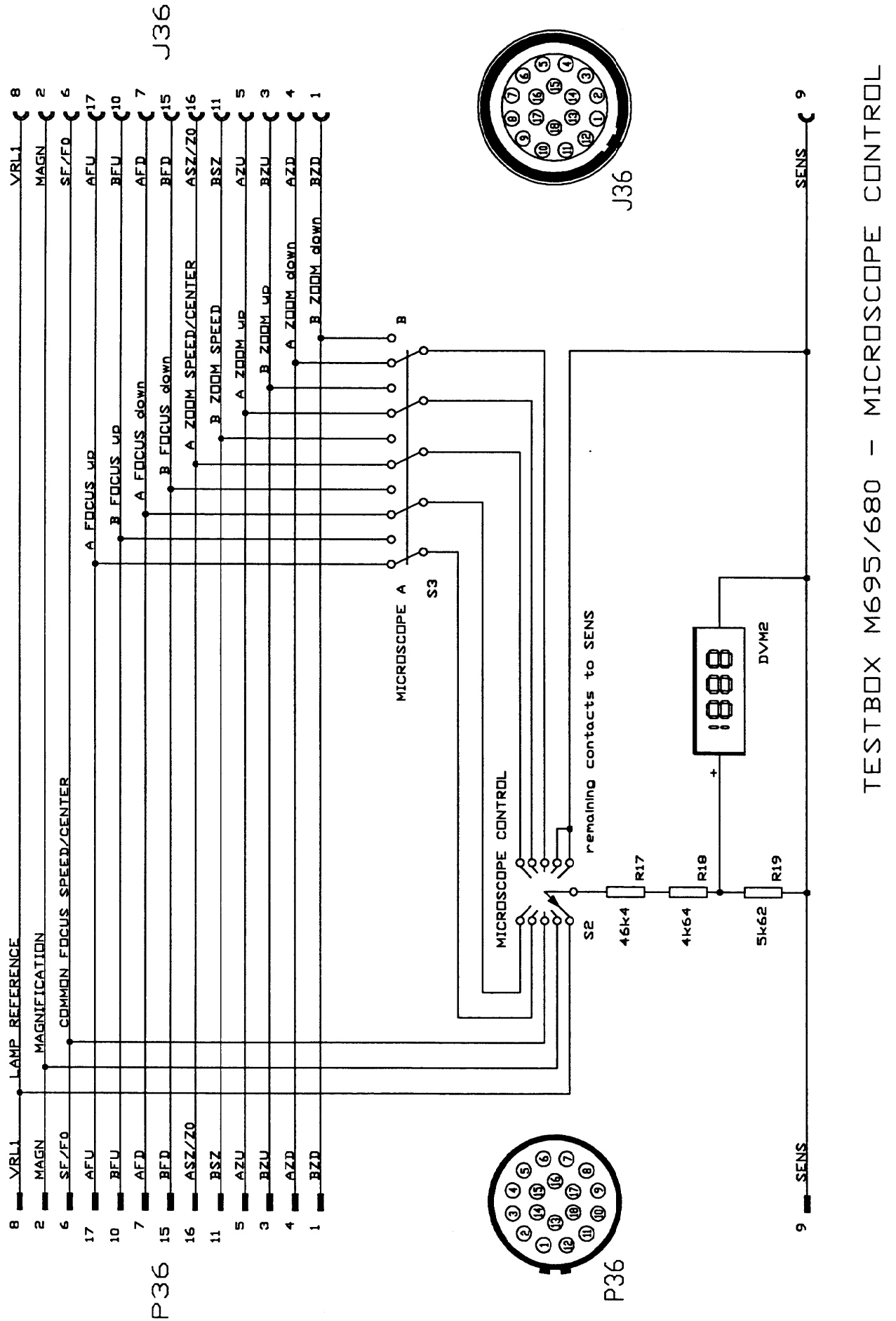
***Specifications:***

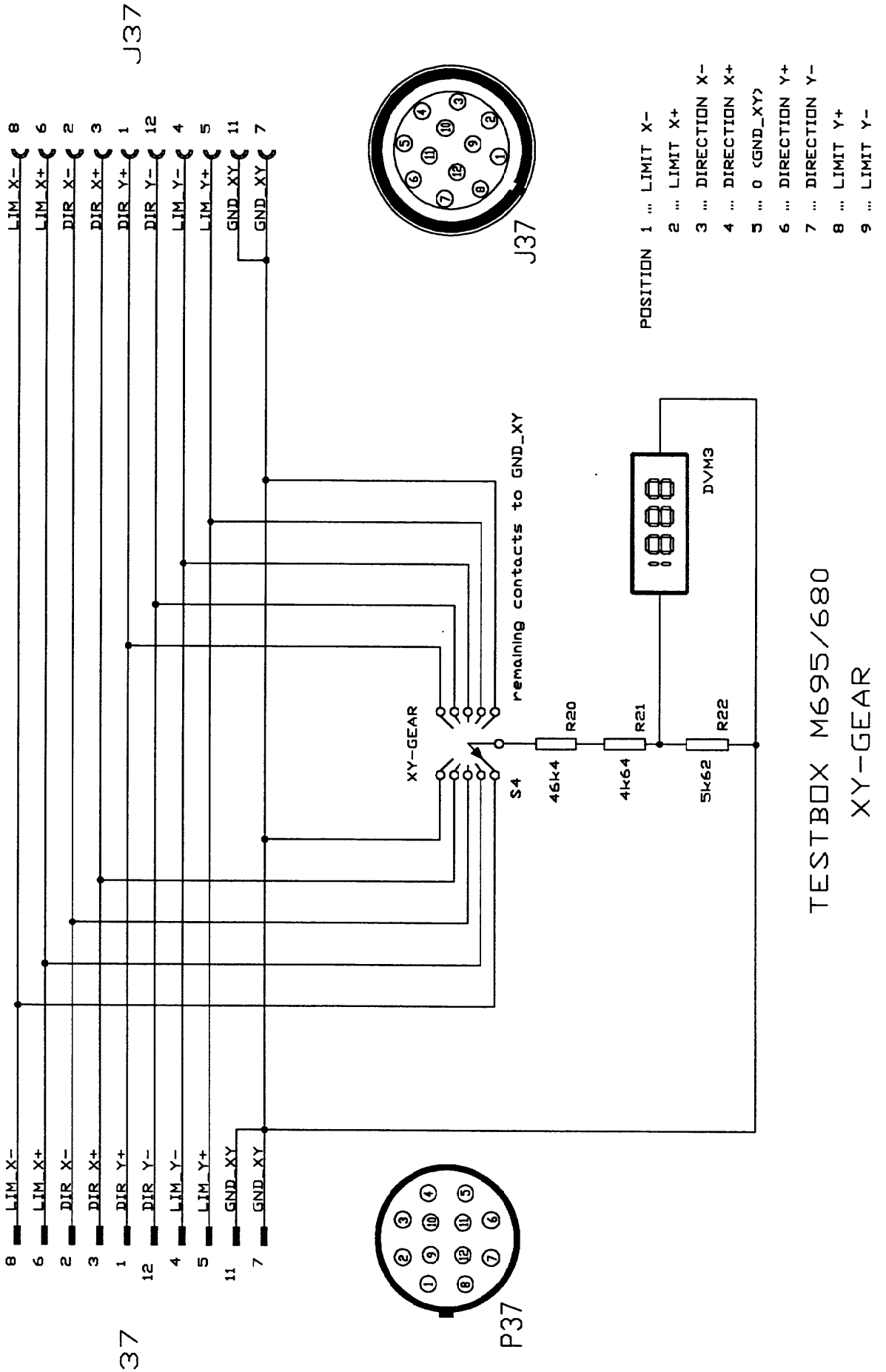
**Voltage measurement:** +-3% +-1 digit

**Current measurement:** +-5% +-1 digit


TESTBOX M695/680
POWER SUPPLY DVM's
1/2 S1
POWER
GND DP
DP2
DP1
DVM1
DVM2
DVM3
DP2
12V
U1
U2
U3
DC
18-34V
C2
10nF
C1
100pF
D1
D2
D3
D4
2x 2N4004
2X 2N4004
24V_M
24V_XY
GND_XY
PGND
P36
P37
CONNECTION SIDE


TESTBOX M695/680
POWER
J37
J36
P37
P36
DVM1
POWER
1/2 S1
R16 0E1/4W
R15 0E1/4W
R1 681E
R2 2k15
R3 4k64
R4 46k4
R5 5k62
R6 4k64
R7 46k4
R8 4k64
R9 46k4
R10 681E
R11 2k15
R12 5k62
R13 4k64
R14 46k4
24V
12V
GND_XY
PGND
SENS
S1 POSITION
1 ... VOLT 24V MICROSCOPE
2 ... VOLT 24V XY-TILT
3 ... VOLT 12V XY-TILT MOTOR
4 ... 0
5 ... AMPERE 24V MICROSCOPE
6 ... AMPERE 12V XY-TILT MOTOR

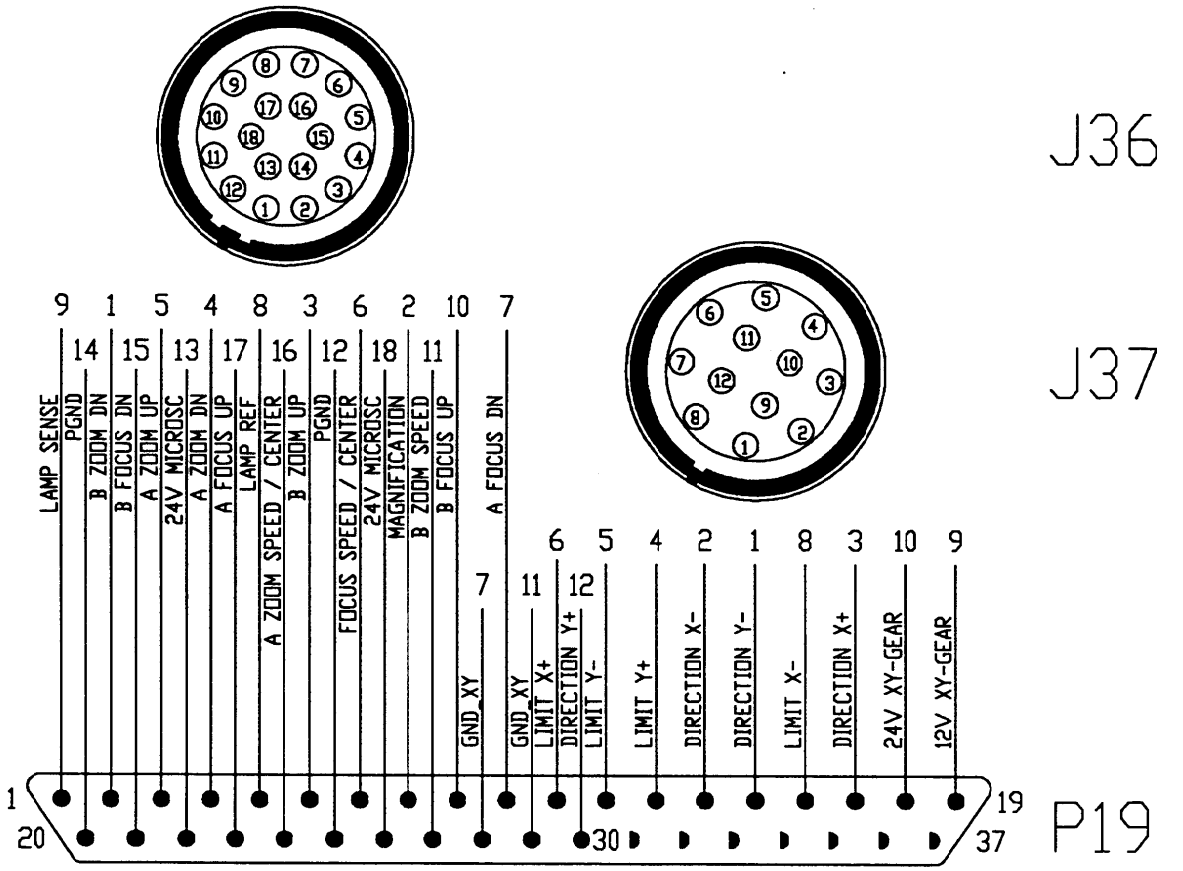

TESTBOX M695/680 - MICROSCOPE CONTROL
J36
P36
VRL1
LAMP REFERENCE
MAGN
MAGNIFICATION
SF/FO
COMMON FOCUS SPEED/CENTER
AFU
A FOCUS up
BFU
B FOCUS up
AFD
A FOCUS down
BFD
B FOCUS down
ASZ/ZO
A ZOOM SPEED/CENTER
BSZ
B ZOOM SPEED
AZU
A ZOOM up
BZU
B ZOOM up
AZD
A ZOOM down
BZD
B ZOOM down
SENS
MICROSCOPE A
S3
S2
MICROSCOPE CONTROL
remaining contacts to SENS
R17
46k4
R18
4k64
R19
5k62
DVM2


J37
LIM_X- 8
LIM_X+ 6
DIR_X- 2
DIR_X+ 3
DIR_Y+ 1
DIR_Y- 12
LIM_Y- 4
LIM_Y+ 5
GND_XY 11
GND_XY 7
POSITION 1 ... LIMIT X-
2 ... LIMIT X+
3 ... DIRECTION X-
4 ... DIRECTION X+
5 ... 0 <GND_XY>
6 ... DIRECTION Y+
7 ... DIRECTION Y-
8 ... LIMIT Y+
9 ... LIMIT Y-
remaining contacts to GND_XY
XY-GEAR
S4
R20
46k4
R21
4k64
R22
5k62
DVM3
P37
TESTBOX M695/680
XY-GEAR

# *Service cable M695 / M680*

***for bridging the swingarm***

The service cable enables you to say whether the fault is in the control unit or in the swingarm.



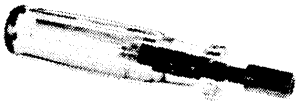
| Art.Nr. | Benennung / Spezifikation | Bemerkung | Zeichnung |
|---|---|---|---|
| Stock n°. | Description / Specification | Remark | Drawing |

Spare parts list M695

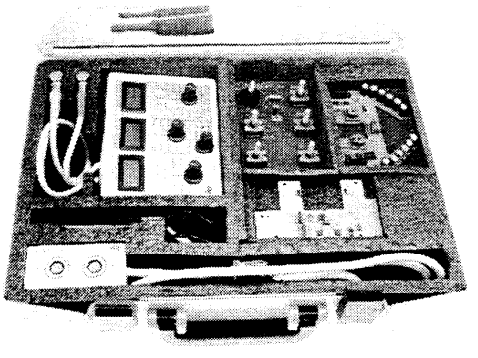
| | | |
|---|---|---|
| **355 980** | Lamp-control board | See page 11-2<br><br>**Attention when the board is replaced at** Instruments or with control units which are delivered since martch 94:<br>If the lamp control board does not have index C of modification or later it must be modified as shown on page 2-1.<br><br>Else the following fault occurs:<br>the hand-/footswitch at control input B does not react. |
| **433 826** | Gas spring | See page 10-4 |
| **507 990** | Focus servo board | See page 11-1 |
| **526 770** | Function display | Seepage 11-4 |
| 561 950 | Panel hoard für MEL64/65 | Seepage 11-3 |
| **567 930** | Panel board für MEL61/62 | See page 11-3 |
| **635 859** | Swingarm cable | See page 10-5 |
| **635 972** | Receiver board | See page 11-4 |

| Art.Nr. / Stock n° | Benennung / Spezifikation / Description / Specification | Bemerkung / Remark | Zeichnung / Drawing |
|---|---|---|---|

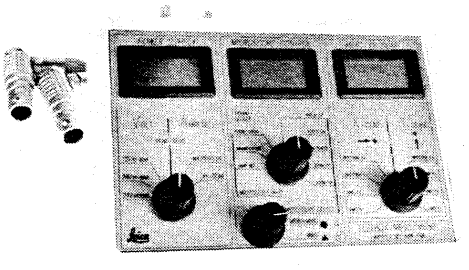
401 283 Pin spanner



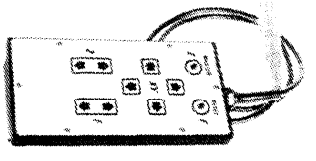
418 135 Handle for pin spanner



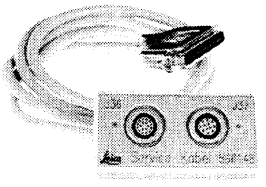
566 152 Test set compl. *without boards*



566 146 Test box



566 147 Hand switch mod.



556 148 Service cable (M680/M695)

566 151 Box